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# USSR Report

CHEMISTRY

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USSR REPORT  
CHEMISTRY

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## ADSORPTION

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### ADSORPTION OF BARBITURATES BY MACROPOROUS ION EXCHANGES

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA in Russian No 3, May-Jun 86 (manuscript received 19 Jul 83) pp 61-64

[Article by Ye.Ye. Yergozhin, K.S. Ormantayev, Z.A. Nurkhodzhayeva, L.N. Prodius, L.M. Shustova and T.M. Musina, Institute of Chemical Sciences, Kazakh SSR Academy of Sciences, Alma-Ata]

[Abstract] Trials were conducted with ion-exchangers to identify efficient systems for the adsorption of Nembutal and Barbamyl from aqueous solutions. Using a macroporous styrene-8% hexamethylenedimethacrylamide carrier, phosphoric acid cation exchangers were found ineffective as adsorbents, leading to reduction to pyrimidine. The same carrier system was found to be highly efficient when used with anion exchange groups, leading to 74.0 to 92.0% adsorption of Nembutal in 60 min. In the latter case triethylamine was found to be most efficient (92.0%), followed by trimethylamine (88.6%), triethanolamine (86.2%), diethanolamine (82.5%), and ethanolamine (74.0%). Figures 1; references 7 (Russian).

12172/9716

CSO: 1841/579

## ALKALOIDS

### SPECTRUM ANALYSIS CENTER SUPPORT TO RESEARCH

Yerevan KOMMUNIST in Russian 9 Jul 86 p 1

[Article by V. Musayelyan: "A Billionth of a Gram"]

[Text] Miniature test tubes containing solutions of substances to be analyzed are inserted into sockets in the automatic system. Keys are depressed on the instrument's control panel, and the process begins. Forty to 45 seconds later the recorder prints out the results of the analysis of the solution's elemental composition. All operations are monitored and fulfilled by a microcomputer built into the instrument.

We are in the laboratory of the Center for Collective Use of Equipment for Spectrum Analysis (TsKPO), established in an independent planning and design office of the Yerevan Polytechnic Institute.

The qualitative and quantitative composition of the samples is determined by the exact and sensitive method of spectrum analysis. It makes it possible to reveal presence of a chemical element--an impurity--in amounts as little as a billionth of a gram. It is not always possible to carry out such analysis by chemical methods because this quantity is so small.

Spectrum analysis is widely employed in medicine, food industry, geology, metallurgy, criminology and so on. It is necessary and effective in cases where purity of the initial materials is required--in production of monocrystals for laser semiconductor technology, fiber-optic light guides and so on.

"Our center," explained its director, Candidate of Chemical Sciences O. Afrikyan, "was created by decision of the republic's directive organs with the purpose of raising the effectiveness with which expensive, unique scientific equipment and instruments are used for the needs of the national economy, irrespective of departmental subordination. Precision and one-of-a-kind pieces of equipment, both Soviet and foreign, are concentrated here. The instruments are serviced by highly qualified specialists--engineers and technicians. The TsKPO is forming its own school of spectroscopists: Besides doing pure spectrum analysis work requested by various organizations, the center is creating new procedures for taking spectrophotometric measurements and improving existing ones. We readily share

these procedures with others, and recommend them for introduction in other institutions.

The range of the center's tasks includes technical and methodological assistance to organizations trying to create their own spectrum analysis services, and training specialists for them.

During the time that the center has been in existence, close and productive ties have been established with the Institute of Physical Research of the Armenian SSR Academy of Sciences, the Sapfir APO [not further identified], the Kirovakan Chemical Plant, the Yerevan Medical Institute, the Sevan Hydrobiological Station of the Armenian SSR Academy of Sciences and other republic and union organizations.

Highly sensitive express methods developed by the TsKPO were used for spectrum analysis of the concentration of microelements in crystals, food products, the waters of rivers and lakes, and so on. The center is now doing work associated with the Food Program and with the problems of ecological research.

11004

CSO: 1841/588

UDC 543.544/2:547.94

LIQUID CHROMATOGRAPHY OF ALKALOIDS. PART 7. ION EXCHANGE CHROMATOGRAPHY OF OPIOID ALKALOIDS ON BONDAPAK CX/CORASIL

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA in Russian No 3, May-Jun 86 (manuscript received 7 Jul 83) pp 80-86

[Article by P.P. Gladyshev, Ye.F. Matantseva and L.N. Bykova, Institute of Chemical Sciences, Kazakh SSR Academy of Sciences, Alma-Ata]

[Abstract] A mathematical analysis was conducted on the chromatography of the opioid alkaloids morphine, codeine, thebaine, papaverine and narcotine on the cationic exchange Bondapak CX/Corasil, in order to define the chromatographic adsorption mechanism. Using a phosphate buffer system for elution with acetonitrile resulted in the demonstration that binding was hydrophobic and virtually irreversible. As the concentration of the organic solvent increased, the partition coefficient diminished. Evaluation of the actual plots of partition coefficients versus concentration in comparison with theoretical plots demonstrated that an ion exchange mechanism is responsible for chromatographic separation. Figures 3; references 9: 5 Russian, 4 Western.

12172/9716

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## SEPARATION OF COLCHAMINE FROM COLCHICINE IN AQUEOUS SOLUTIONS OF FIBROUS CATIONIC EXCHANGE ADSORBENT

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNLOGIYA in Russian Vol 29, No 5, May 86 (manuscript received 19 Nov 84) pp 65-67

[Article by A. Ch. Kadyrov, Sh. Ch. Kurbanov, U. N. Musayev, A.V. Vlasov and B. L. Tsetlin, Tashkent State University im. V.I. Lenin, Department of Chemistry of Synthetic Polymers; Central Scientific-Research Institute for Cotton Industry]

[Abstract] Adsorption of colchamine (I) and a mixture of it with colchicine (II) from aqueous solutions on a fibrous cationic exchange adsorbent was studied in static and dynamic experiments. The adsorbent was synthesized from acrylic acid and polypropylene by radiative polymerization. The alkaloids can be separated because (II) does not form salts of mineral acids and only (I) is adsorbed by the cationite. Dynamic experiments to separate (I) from (II) were made through a column with ion exchange fiber ( $d=1.1$ ,  $h=10$  cm) in  $H^+$  form at filtration rate 1.0 ml/min. After the ionite was saturated with the alkaloids, desorption was carried out with 10% acetic acid. Alkaloid concentrations were determined by ultra violet spectroscopy at  $352\text{ cm}^{-1}$  and chromatographic analysis on silica gel with 13% gypsum in a system of chloroform-methanol-benzene-acetic acid. The effect of pH of the starting solution on adsorption of (I) indicated that the coefficient of distribution  $K_d$  rises sharply with a pH increase and reaches a maximum of 1400 at pH 12, but experiments were made in neutral aqueous solutions because (I) is less stable in the alkaline region. The effect of pH on (II) was not observed and it is partially adsorbed from a neutral medium with  $K_d = 154.7$ . Process kinetics and temperature are important factors in adsorption of organic ions with fibrous adsorbents. Equilibrium adsorption at 25, 30 and 50°C was attained in 2.0, 1.0 and 0.5 hrs., respectively, for (I) at pH 7.4. Thermodynamic parameters of adsorption were determined for (I) at pH 7. These were ionic exchange constant  $K$ , free energy  $\Delta G$ , enthalpy  $\Delta H$  and entropy component  $T\Delta S$ . The dynamic exchange capacity and the maximum dynamic exchange capacity of the ionite for (I) is 330 and 384 mg/g, respectively. The prospect of using a fibrous polymeric adsorbent from acrylic acid and polypropylene for developing an effective method for separating alkaloids was demonstrated. Figures 4; references 4 (Russian).

12286/9716  
CSO: 1841/597

UDC 66.023:541.183

APPARATUS FOR MEASUREMENT OF ADSORPTION OF  $H_2$  AND  $D_2$  ISOTOPES UNDER  
EQUILIBRIUM CONDITIONS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 7,  
Jul 86 (manuscript received 11 Oct 85) pp 1679-1681

[Article by M.A. Levin, V.V. Serpinskiy, T.S. Yakubov and M.B. Gorbunov,  
Institute of Physical Chemistry, USSR Academy of Sciences, Moscow]

[Abstract] A schematic is presented of a volumetric apparatus used to measure the adsorption of  $H_2$ ,  $D_2$  and mixture of the isotopes under equilibrium conditions to zeolite NaX. Studies were conducted over a temperature range of 100-300 K under a pressure of 6 MPa. The two approaches used in the study--direct measurement of adsorption isotherms and measurement of adsorption along constant gas level curves with changing temperature--demonstrated that NaX is a useful adsorbent that can be used for the separation of these two isotopes. An advantage of the latter method is that error is not cumulative and remains the same as in the first filling. Figures 2; references 6: 4 Russian, 2 Western.

12172/9716  
CSO: 1841/601

UDC 662.753.12:665.521.23

METHOD FOR DETERMINATION OF CORROSIVENESS OF GASOLINES WITH SYNTHETIC  
COMPONENTS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 6, Jun 86 pp 14-15

[Article by S.R. Lebedev, O.A. Burmistrov, O.F. Ivleva and Ye.Ya. Vazhnik]

[Abstract] A method was devised for assessing the corrosive properties of gasolines, with synthetic octane boosters, which consists of a hermetically-sealed bomb filled with 50 ml of the gasoline and a 40 mm x 4 mm metal strip. Exposure is for 6 h at 80°C, with degree of corrosion evaluated in terms of weight loss by the metal. Comparative evaluations demonstrated that gasolines with 5 vol % methanol or 15 vol % methanol + 7 vol % isobutanol were

far more corrosive than native gasoline or gasoline supplemented with 11 vol % methyl tert-butyl ether. In addition, lead and lead-based alloys were identified as the metals most susceptible to the corrosive effects, indicating that they should be avoided in internal combustion engines. Figures 1; references 6: 3 Russian, 3 Western.

12172/9716  
CSO: 1841/583

UDC 543.423.067:543.056

ATOMIC EMISSION ANALYSIS OF HIGHLY PURIFIED GERMANIUM DIOXIDE FOLLOWING  
VAPOR-PHASE PRECONCENTRATION OF ELECTRODE IMPURITIES IN AUTOCLAVE VESSEL

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 41, No 7, Jul 86  
(manuscript received 11 May 85) pp 1173-1176

[Article by V.G. Pimenov, D.A. Timonin and V.N. Shishov, Institute of  
Chemistry, USSR Academy of Sciences, Gorkiy]

[Abstract] A method has been devised for the determination of impurities in  $\text{GeO}_2$ , which relies on using the  $\text{GeO}_2$  as an anode over a graphite cathode in a closed vessel over concentrated  $\text{HCl}$ , with heating of the system at  $200^\circ\text{C}$  for 3 h. Subsequent atomic emission analysis on the concentrates was conducted at 220-350 nm. The basic chemical process in the autoclave vessel can be described as follows:  $\text{GeO}_2 + 4\text{HCl} \rightleftharpoons \text{GeCl}_4 + 2\text{H}_2\text{O}$ , and can be regarded as a distillation process subsequent to chemical transformation. Determinations of unknowns and recovery studies showed that the lower detection limit for this system, based on 3s criteria, is  $2 \times 10^{-6}$  to  $8 \times 10^{-8}$  wt%, with a relative standard deviation of 0.2-0.4. Figures 2; references 12: 1 Hungarian, 7 Russian, 4 Western.

12172/9716  
CSO: 1841/592

UDC 543.062:546.46:543.423

DETERMINATION OF BERYLLIUM IN NATURAL AND WASTE WATERS BY ATOMIC EMISSION  
SPECTROSCOPY FOLLOWING CHEMICAL EXTRACTION

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 41, No 7, Jul 86 (manuscript received 24 Jun 85) pp 1200-1205

[Article by Yu.A. Makhnev, M.I. Degtev, T.A. Chapko, L.A. Kozhevnikova and  
M.A. Khorkova, Perm State University imeni A.M. Gorky]

[Abstract] An atomic emission method was devised for the analysis of beryllium levels in natural and waste waters, relying on the extraction of Be by diantipyryl-methane (DAM) following acidification with trichloroacetic acid. Studies on the partition of Be showed that the constant was proportional to the square of the concentration of the ligand and the extractant,

indicating that the complexes could be depicted as follows:  $\text{Be}(\text{DAM})_2(\text{CCl}_3\text{COO})_2$ . The alkyl homologs of DAM were less efficient in complexing with Be, with the decrease in efficiency directly proportional to the length of the hydrocarbon chain. Measurement at the 234.86 nm line showed that addition of  $\text{CuCl}_2$  carrier increased its intensity more than 2.5-fold. In the presence of  $\text{CuCl}_2$  the lower limit of Be detection was at the  $3 \times 10^{-7}\%$  level, and in the absence of the carrier at  $2.6 \times 10^{-6}\%$ . Figures 4; references 15 (Russian).

12172/9716  
CSO: 1841/592

UDC 543.4:542.61:546.47

#### PHOTOMETRIC ANALYSIS OF ZINC IN GEOLOGIC SAMPLES USING PHENYLFLUORONE COMPLEXES

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 41, No 7, Jul 86  
(manuscript received 4 Jul 85) pp 1206-1208

[Article by A.P. Rubel, L.I. Vinarova, V.P. Antonovich and Ye.S. Ivanova, Physicochemical Institute imeni A.V. Bogatskiy, Ukrainian SSR Academy of Sciences, Odessa]

[Abstract] A method is proposed for the rapid analysis of zinc in various geologic samples, using photometry at 554 nm of zinc-phenylfluorone complexes. Samples dried at  $400^\circ\text{C}$  were reconstituted in n-butanol solutions of biphenyl guanidine, phenylfluorone, and tri-n-octylamine to form a Zn-phenylfluorone-biphenyl guanidine complex. The complex, extracted with a 1:1 toluene:n-butanol mixture had a molar absorption coefficient of  $8.4 \times 10^4$ , displaying adherence to Beer's law in the range of 1 to 10  $\mu\text{g}/25 \text{ ml}$ . Evaluations of unknowns and recovery studies confirmed the utility of this approach to the analysis of Zn in geologic samples. References 5: 4 Russian, 1 Western.

12172/9716  
CSO: 1841/592

UDC 543.544:547.775

#### DETERMINATION OF URANIUM(VI) BY PEAK CHROMATOGRAPHY

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 41, No 7, Jul 86 (manuscript received 30 May 85) pp 1216-1219

[Article by I.P. Sizeneva and I.S. Kalmykova, Perm Polytechnic Institute]

[Abstract] A method has been devised for filter paper determination of U(VI) by the formation of an insoluble complex with diantipyryl-methane (DAM), which does not require reduction of U(VI) to U(IV). Description is provided of the formation of rhodanide and iodide complexes of U(VI) with DAM --  $(\text{RH})_2\text{UO}_2(\text{SCN})_4$  and  $\text{RUO}_2\text{I}_2$  -- with an analysis on the effects of filter paper density on precipitation and of pH. For chromatographic studies on FN-3 and



FN-11 paper 0.1 M  $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  solutions were prepared, with U(VI) precipitated with 1:1 ammonia solution, and calcination of the precipitated  $\text{UO}_2(\text{OH})_2$  to  $\text{U}_3\text{O}_8$ . Unknowns and standard solutions were applied to paper pretreated with DAM and  $\text{NH}_4\text{SCN}(\text{KI})$  solutions in a concentration insufficient for complete precipitation of uranium at the point of application. Subsequent impregnation of the paper with the eluent  $\text{NH}_4\text{SCN}(\text{KI})$  resulted in migration of the unprecipitated uranium ions and formation of chromatographic peaks. Chromatograms with the rhodanide complexes yielded bright, yellow patterns, while the iodide complexes were pale yellow. The latter were developed with either arsenazo I or arsenazo III. The areas and peak heights were directly proportional to uranium concentration. References 7 (Russian).

12172/9716  
CSO: 1841/592

UDC 543.44.062.615.2/3

#### KINETIC METHOD OF ANTIPYRINE DETERMINATION

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 41, No 7, Jul 86  
(manuscript received 9 Jul 85) pp 1243-1246

[Article by O.V. Kamentseva, Ye.B. Smirnova, G.A. Zolotova and I.F. Dolmanova, Moscow State University imeni M.V. Lomonosov]

[Abstract] A rapid kinetic method has been developed for the determination of blood levels of antipyrine, which is based on the action of antipyrine in accelerating oxidation of diphenylcarbazone by hydrogen peroxide (borate buffer, pH 8.7). The method was determined to have a sensitivity of  $10^{-2}$   $\mu\text{g}/\text{ml}$ , and can be completed in 30-40 min versus conventional techniques that require 5-6 h. In addition, the method yielded excellent agreement with results obtained by the spectrophotometric and GLC methods. Figures 1; references 5: 2 Russian, 3 Western.

12172/9716  
CSO: 1841/592

UDC 577.158.54

#### DETERMINATION OF MICROQUANTITIES OF $\text{NAD} \cdot \text{H}_2$ , NAD AND FORMATE WITH BIOLUMINESCENT SYSTEM UTILIZING COIMMOBILIZED ENZYMES

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 41, No 7, Jul 86 (manuscript received 2 Jul 85) pp 1247-1252

[Article by O.V. Lebedeva, I.G. Frumkina and N.N. Ugarova, Moscow State University imeni M.V. Lomonosov]

[Abstract] Details are presented on the combined immobilization of  $\text{NAD} \cdot \text{H}_2$ :FMN oxidoreductase, bacterial (*Beneckea harveyi*) luciferase, and formate dehydrogenase on BrCN-agarose. Immobilization of the three-enzyme system

resulted in marked stabilization of the enzymes and enhanced enzymatic activities, with a 10- to 100-fold increased sensitivity for the individual substrates. Analytical sensitivity for  $\text{NAD}\cdot\text{H}_2$  was in the range of  $10^{-12}$  to  $10^{-7}$  M, for NAD  $10^{-10}$  to  $10^{-12}$  M, and for formate  $10^{-12}$  to  $10^{-7}$  M. Figures 2; references 15: 6 Russian, 9 Western.

12172/9716  
CSO: 1841/592

UDC 546.65:543.426

# LOW TEMPERATURE LUMINESCENCE OF EUROPIUM TUNGSTATE AND ITS APPLICATION IN ANALYSIS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNLOGIYA in Russian Vol 29, No 5, May 86 (manuscript received 17 Sept 84) pp 49-52

[Article by S.V. Beltyukova, T.B. Kravchenko and Ye. N. Poluektov, Odessa Technologic Institute of Food Industry, Department of Analytical Chemistry; Physical Chemical Institute, USSR Academy of Sciences]

[Abstract] Luminescent properties of compounds of europium with sodium tungstate at  $77^\circ\text{K}$  were studied. A luminescent method was developed for determining europium in oxides of lanthanides. Luminescence spectra of aqueous solutions of europium chloride and tungstate at  $77^\circ\text{K}$  and wavelengths of 575-620 nm were determined. The greatest intensity of luminescence of europium tungstate was at pH 6.5. Maximum intensity of luminescence was obtained at sodium tungstate concentration in solution of  $1.5 \times 10^{-3}$  mole/l (at europium concentration of  $1 \times 10^{-4}$  mole/l). The effect of organic solvents on the luminescence intensity of europium in compounds with the tungsten ion showed a sharp reduction. In mixtures (1:1) of ethylene glycol, glycerine and dimethylsulfoxide, luminescence intensity of europium was 37, 22 and 15%, respectively, of that without organic solvents. Luminescent properties of europium compounds with sodium tungstate at  $77^\circ\text{K}$  were utilized for determining europium in oxides of lanthanides and yttrium.  $\text{La}_2\text{O}_3$ ,  $\text{Gd}_2\text{O}_3$  and  $\text{Y}_2\text{O}_3$  were analyzed after converting them to chlorides and adding various amounts of standard solution of europium chloride and 1.5 ml of 0.01 M sodium tungstate solution. Intensity was determined at wavelength 594 nm and pH 6.5. Europium of 2.0-6.9 % was found in the lanthanide oxides. The limit of europium detection was  $1 \times 10^{-4}\%$ . Figure 1; references 8: 5 Russian, 3 Western.

12886/9716  
CSO: 1841/597

## CATALYSIS

UDC 547.592.3:542.941

CATALYTIC ACTIVITIES OF COORDINATION COMPOUNDS FORMED BY POLYAMINES WITH  
Ni, Co, Rh, Ru OR Pd

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA in  
Russian No 3, May-Jun 86 (manuscript received 22 Jan 84) pp 20-24

[Article by V.N. Perchenko, T.O. Omaraliyev, R.Sh. Abubakirov and G.A. Sytov,  
Kazakh Institute of Chemical Technology, Chimkent]

[Abstract] Complexes were formed from Ni, Co, Rh, Pd and Ru chlorides and either polyethyleneimine or polytrimethyleneimine (nitrogen: metal = 2:1 to 4:1), and tested for catalytic activity in hydrogenation of 1,3-pentadiene (PD). The catalytic efficiencies of the complexes--following reduction with either hydrogen or boron hydride, at 280-330 K, 0.1-0.6 MPa hydrogen pressure, and substrate:metal ratio of 75--ranked as follows: Pd > Rh > Ru > Co > Ni. Studies with either the cis- or trans-PD isomer showed that Ru failed to catalyze cis- and trans- isomerization. Detailed analyses of Pd and Ru reactions demonstrated that the trans- isomer of PD is hydrogenated much more rapidly than the cis- isomer. Hydrogenation of a mixture of PD isomers over Pd and Ru catalysts yields alpha and beta olefins, with trans-2-pentene figuring as the predominant product. Since the latter is obtained from both PD isomers, and because of the absence of cis/trans isomerization of PD, it appears that the complexes preferentially hydrogenate dienes in the thermodynamically more stable transoidal conformation. References 14: 12 Russian, 2 Western.

12172/9716

CSO: 1841/579

## INTERACTION OF HYDROGEN WITH Ce AND Pd-Ce CATALYSTS ON ALUMINUM OXIDE

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA in Russian No 3, May-Jun 86 (manuscript received 28 Feb 84) pp 53-58

[Article by L.V. Babenkova, A.G. Sarmurzina, K.M. Kubanova and L.M. Kurashvili, Institute of Organic Catalysis and Electrochemistry, Kazakh SSR Academy of Sciences, Alma-Ata]

[Abstract] Thermodesorption and x-ray diffraction analyses were combined in a study of adsorption of hydrogen to 0.3% Pd/Al<sub>2</sub>O<sub>3</sub>, 6.3% Ce/Al<sub>2</sub>O<sub>3</sub> or 6.3% Ce-0.3% Pd/Al<sub>2</sub>O<sub>3</sub> catalysts. Adsorption of hydrogen at 723 K to the Ce catalyst involved three species of bonds differing in strength. Approximately 94% of the hydrogen is held by strong bonds with a maximum desorption temperature of 953 K. Introduction of small amounts of Pd (0.3%) resulted in binding rearrangements, with a sharp increase from ca. 6 to 70% in weakly bound hydrogen desorbing at low temperatures ( $T_{\max} = 538$  K). The latter change was attributed to a decrease in the CeO<sub>2</sub> component in the Ce-Pd catalyst, due to the reducing effects of high temperatures as a result of donor-acceptor interactions between Pd and CeO<sub>2</sub>. Figures 1; references 12 (Russian).

12172/9716  
CSO: 1841/579

UDC 665.644.2.097.3:661.183.6/:543

## THERMOCHEMICAL PROCESSING OF ZEOLITE CATALYSTS WITH RARE EARTH ELEMENTS USED IN CRACKING

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 6, Jun 86 pp 2-4

[Article by V.L. Bayburskiy, A.P. Kosolapova, S.I. Rabinovich and T.A. Bolshakova, Groznyy Scientific Research Petroleum Institute]

[Abstract] A cursory analysis is presented of the steps involved in the thermochemical processing of zeolite hydrogels intended for catalytic cracking, to define optimum parameters for the replacement of Na<sup>+</sup> by rare earth cations. The freshly prepared pellets were treated, in succession, by nitrate salts of the rare earth elements and ammonia, and washed with salt-free water. In the ion-exchange step the rare earth cations were taken up most intensively after 4 h of heat treatment, corresponding to the time of highest sodium elimination from the zeolite pellets. The ion-exchange steps were defined to involve initial replacement of Na<sup>+</sup> by NH<sub>4</sub><sup>+</sup>, and subsequently by Ln<sup>3+</sup>. Such a sequence favors displacement of Ln<sup>3+</sup> from the pellets in the upper part of the column by NH<sub>4</sub><sup>+</sup> and, consequently, results in uniform distribution of Ln<sup>3+</sup> in the bulk. Uniform distribution of the rare earth cations requires their application jointly with NH<sub>4</sub><sup>+</sup>. However, since aluminum hydroxide in the aluminosilicate matrix diminishes the exchange capacity, the concentration of NH<sub>4</sub><sup>+</sup> in the second activating solution should be decreased. Figures 4; tables 2; references 5 (Russian).

12172/9716  
CSO: 1841/583

## CONVERSION OF HEXENE-1 ON ZEOLITE CATALYSTS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA  
TEKHNOLOGIYA in Russian Vol 29, No 5, May 86 (manuscript received 9 Oct 84)  
pp 38-40

[Article by A.Z. Dorogochinskiy, M.N. Zhavoronkov and A.L. Proskurnin,  
Grozny Petroleum Institute imeni Acad. M.D. Millionshchikov, Department of  
Petrochemical Synthesis]

[Abstract] Catalytic activity of lanthanum zeolite of type Y, LaNaY-96, and zeolite containing catalyst Zeokar-2 was studied for conversion of hexene-1 at 350-475°C with a 4 hr. volumetric feed rate and 30 cm<sup>3</sup> catalyst in the reactor. The lanthanum zeolite was type Y ( $\text{SiO}_2/\text{Al}_2\text{O}_3 = 3.9$ ) with 96% exchange of the Na cations for La cations and Zeokar-2 was obtained with addition of 16% zeolite type Y into the amorphous matrix with rare earth cations. Splitting of hexene-1 to C<sub>1</sub>-C<sub>5</sub> hydrocarbons, isomerization of hexene-1, disproportionation of hydrogen, formation of liquid polymers and chemisorbed products of condensation occur for both catalysts under the studied conditions. Conversions of hexene-1 were 97-99.5%. LaNaY-96 favors splitting reactions, formation of isoparaffins C<sub>4</sub>-C<sub>6</sub> (49.1-32.7% at 350-475°C at 4 hr. but 17.1-4.1% for Zeokar-2) and chemisorbed products of condensation (9.4-10.2% for LaNaY-96 and 1.4-3.4% for Zeokar-2). Zeokar-2 is more active for polymerization reactions with 40.6-32.9% and 9.6-14.1% for LaNaY-96. With an increase of temperature from 350 to 475°C, the intensity of hydrogen disproportionation is reduced and formation of chemisorbed products of condensation is increased. The effect of volumetric feed rates of 2-10 hrs. on catalyst activity for both catalysts showed that the yield of isoparaffins C<sub>4</sub>-C<sub>6</sub> decreased with an increase of time for both catalysts and a maximum yield of 32.7% was realized at 4 hrs. for LaNaY-96. References 1 (Russian).

12886/9716  
CSO: 1841/597

## CHEMICAL INDUSTRY

### IMPLEMENTATION OF NEW IDEAS IN CHEMISTRY

Moscow SOVETSKAYA ROSSIYA in Russian 19 Jul 86 p 1

[Article by Academician V. A. Legasov: "Breaking into the Future"]

[Text] There is perhaps not a single scientific institution, design office or plant in the country today which is not seeking ways to upgrade the quality of the products it develops or produces. As a rule, enterprise executives and specialists are well informed about the world's accomplishments in their own areas, and they can see the way we must walk to achieve the same results; many ideas have already been embodied in metal.

But as soon as it gets down to duplicating experimental models, various barriers arise along the path of innovation. There are many of them. First of all there are the shortcomings in the existing economic mechanism, which hinder the reasonable desire to renovate equipment and to reduce outlays on its production. Next there is the absence of a modern machine building base necessary for rapid renewal of fixed capital. This was a topic of substantial discussion at the party congress and at CPSU Central Committee plenums, and the practical work of eliminating the weak points in the economy has now begun.

But there is one other barrier which for the moment remains in the shadows, even though its significance is extremely great, and even though it is precisely what is holding back faster development of our economy. I am referring to the chemical culture of all sectors of the national economy. What we usually associate with the word "chemicalization" is production of acids, salts, mineral fertilizers, polymers, artificial fibers, varnishes, enamels and paints. This is extremely important work, the scale of which is growing with every five-year plan at the fastest rate relative to other sectors. But I would like to turn attention to another side of the problem. In nonchemical sectors such as metallurgy, and especially nonferrous, electronics, food and light industry, in construction materials industry and in numerous others, the bulk of the production operations are essentially chemical operations. They involve preparation and cleaning of materials, painting, gluing, introducing sensitive elements providing information on the state of materials and structures.

Three-fourths of all that is associated with expenditure of material resources in the national economy is associated with the use of chemical knowledge and

skills. Our specialists have full mastery of the former in application to traditional, previously evolved processes. But in the last 10-15 years chemical knowledge has changed swiftly. This pertains chiefly to materials technology.

Remarkable ceramic materials have come into practical use. Their characteristics are a combination of high strength and hardness, and at the same time sufficient elasticity permitting manufacture of the most complex elements of structures and instruments. Extremely thin artificial fibers were created as a result of the successes of organic synthesis and physicochemical polymers. Materials made from them are not only not inferior to natural materials in their qualities, but they even surpass them. Ways were discovered of obtaining fundamentally new materials--organic semiconductors and "metals"--that is, complex chemical compounds possessing electrical conductivity, close in conductivity to metals and, moreover, having readily controllable conductivity.

Medicines containing up to 60 different components in a single preparation, each of which acts upon the body in a prescribed direction, are now being created. Similar "medicines" may be created not only for living organisms but also for machines, in which they "cure" cracks and improve the working conditions of various mechanical elements in working media. Such polyfunctional substances, which can be added as an example in very small quantities to boilers, to internal combustion engines, to fuel, to paints and enamels and to structural members, stabilize combustion processes, reduce part wear and prevent corrosion. They can save us millions of tons of fuel, steel, wood and other materials.

These extremely small but competently introduced additives play the same role in technology that vitamins do in our bodies. Unfortunately in many cases our industry suffers chemical "avitaminosis," which explains the excessive outlays of raw materials and energy in production. Clearly creation of new airplanes, machine tools, motor vehicles, instruments and computers would be impossible without new materials. Progress in modern still and motion picture duplicating and polygraphic technology also depends not so much on the design concepts as on the ability to create the necessary powders, photographic emulsions, dyes, films and reagents.

Today, 92 percent of all consumed energy is obtained through chemical procedures. The responsibility carried by chemistry for solving energy problems will grow in the future--that is, the proportion of chemical sources of current will increase, and what is most important, we will not be able to carry low-grade coal very far without chemical enrichment, we will not be able to operate nuclear sources without radiochemical processing, and we will not be able to protect nature from releases without the use of chemical resources.

It would be difficult to imagine progress in any area without chemistry. Consequently all spheres of the economy must be permeated by modern chemical science and technology. Consequently we must not reduce the volume of lectures and practical work in these subjects in the technical VUZs; instead,



we must upgrade their quality and specialize the students in application to the needs of their future profession.

But even chemical science itself will not be able to deal with the growing demands and requirements of industry in our country without significant changes.

In accordance with the recently adopted "Integrated Program for Chemicalization of the USSR National Economy in the Period to the Year 2000," we are planning to increase production of plastics by a factor of 2.5, to double chemical fiber production, to increase fertilizer production by over a time and a half, and to almost quintuple production of plastic tubing. There are plans for raising chemical production volume to 8 percent, which will save the national economy almost 0.5 trillion rubles.

But all of these plans are associated with increasing industrial output capacities and with producing albeit scarce but known products that have already been assimilated by world practice. We can break into the future only by creating revolutionary technologies. As far as the science of the latest chemical technology in the production of materials and chemical sensory devices, mathematical modeling of chemical processes and chemical safety, chemical dynamics and the art of complex chemical synthesis is concerned, these directions require immediate development. And development would hardly be possible in the traditionally evolved framework through simple enlargement of the number of organizations and scientific associates.

The problem is that the outstanding practical accomplishments of world industry and the renaissance presently observed in chemical theory are associated with appearance of powerful physical resources in the hands of chemists for analyzing and influencing substances, and with the possibilities of computer processing of experimental results and theoretical models. This is why preferential development of new areas of chemical technology and synthesis, and analysis of the properties of materials must be based on a good physicomathematical foundation.

Today's practice of preparing candidate and especially doctorate theses in chemistry is not promoting dynamic movement forward in the different scientific directions. As a rule, the topics being defended by doctorate dissertations were of importance 12-15 years ago. In the time that diploma and candidate projects pertaining to such topics were being written and defended, and during the time that doctorate works were being written and finalized, the basic, most important scientific truths became universally known and universally recognized, they were placed into practical use, and today consequently, "defense" more often assumes the form of a means of paying an expected reward for time on the job and for services rendered, and not defense of new, unexpected principles and ideas, or interesting experimental results requiring nontrivial interpretation. This is why the new directions must be developed on the basis of fundamental knowledge of mathematics, physics, mechanics, chemistry and biology by new, desirably young people working in a new framework which would allow a young specialist, from Omsk or Irkutsk for example, to submit his ideas to competitive review.



And if he wins, his ideas should be tested within 1.5-2 years in a well equipped laboratory or computer center created specially for these purposes-- with its own permanent service personnel and rotating staff of scientific directors and executors. Success in implementing such ideas would entitle the young specialist to one academic degree or another depending on the scale of what he had accomplished.

Scientific leadership of such centers should be assigned to specialists and scientists invited to serve in such positions for a particular period of time, as temporary staff members. Their functions should boil down to selecting the most interesting proposals and evaluating obtained results. Such centers must be open to international cooperation.

This proposal would not repeal the evolved forms and traditions of research, and it would not compete with intersector scientific-technical complexes. This would be a concrete supplement to the existing framework within which the transition from enquiry to production is effected. It should provide a possibility for quick analysis of the most interesting ideas irrespective of where the originators of these ideas live and work.

The events of Chernobyl confirmed that when the necessity arises, we can clear away all of the structural and bureaucratic barriers and work extremely quickly in mixed groups to solve very complex scientific and technical problems. The experience gained there should be made the rule.

11004

CSO: 1841/588

NEW USSR MINISTER OF CHEMICAL INDUSTRY

Rangoon THE WORKING PEOPLES DAILY in English, Tuesday, 19 Aug 86 p 3

[Article attributed to NAB/TASS]

[Text] Moscow, 17 Aug--Yuri Besspalov, Dr of Sciences (technology), has been appointed Minister of the Chemical Industry of the USSR by the Presidium of the USSR Supreme Soviet.

Yuri Besspalov, born in 1939, graduated from the Kazan Institutes of Chemistry and Technology, the Academy of Social Sciences under the CPSU Central Committee. Since 1961 he worked at enterprises of the Chemical Industry Ministry. He has been in senior posts in the apparatus of the CPSU Central Committee since 1979: an instructor, a consultant of the Chemical Industry Department of the CPSU Central Committee, adviser of a CPSU Central Committee Secretary and since 1984 he has been deputy head of the Chemical Industry Department of the CPSU Central Committee.

The Presidium of the USSR Supreme Soviet relieved Vladimir Listov of the duties of Minister of Chemical Industry of the USSR in conjunction with another appointment.

/9716

CSO: 1841/605

## ELECTROCHEMISTRY

UDC 621.357.8:669.14.018.8:661.185.1

### EFFECT OF ADDITION OF ADAMANTANE ON PROCESS OF ELECTROLYTIC POLISHING OF STAINLESS STEEL Cr18Ni9

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNLOGIYA in Russian Vol 29, No 5, May 86 (manuscript received 27 Nov 84) pp 27-29

[Article by Ye. A. Fedorova, E. V. Mitrofanov and V.N. Flerov, Gorkiy Polytechnic Institute imeni A. A. Zhdanov, Department of Technology of Electrochemical Manufacturing]

[Abstract] The process for electrolytic polishing of stainless steel Cr18Ni9 in a sulfate-phosphate electrolyte was studied with the addition of adamantane, a surface active organic substance. Anodic time potential curves at 30 A/dm<sup>2</sup> with adamantane of 0.0, 0.5, 0.75, 1.0 and 1.5 g/l were determined. The addition significantly retards the active region of the anodic process in ss Cr18Ni9. Anodic current densities with respect to several variables with and without adamantane were explored. Addition of adamantane to the sulfate-phosphate electrolyte for electropolishing ss Cr18Ni9 enhances processing and does not change the limiting stage of the process. Adamantane addition results in braking the diffusive and chemisorbed stage of the anodic solution of the metal, increasing the electric resistance of the oxide film and improving the quality of processing. Addition of 0.5-1.0 g/l adamantane improved the quality of processing and electropolished parts of ss Cr18Ni9. Reflectivity of the polished surface exceeded 90% in 3-4 min. and current density of 40-60 A/dm<sup>2</sup>. Processing without adamantane addition is significantly more difficult. Figures 4; references 7 (Russian).

12886/9716

CSO: 1841/597

## FERTILIZERS

### DEVELOPMENT OF RAW MATERIAL BASE FOR PRODUCTION OF PHOSPHORUS FERTILIZERS

Moscow. **PLANOVoye KHOZYAYSTVO** in Russian No 7, Jul 86 pp 82-87

[Article by USSR State Commission on Mineral Resources chairman A. Bybochkin and USSR Gosplan chief specialist A. Petrenko]

[Text] Phosphorus--a main source for raising soil fertility. The factors of intensifying development of phosphorus fertilizer production. Sources of raw materials and their development. Improving the use of phosphorus fertilizers--a reserve for intensifying agricultural production.

As we know, development of mineral fertilizer production occupies a leading place in chemicalization of agriculture--the most important source for raising yields. Use of all forms of mineral fertilizers is growing significantly in conjunction with the course toward intensification of agricultural production. The extent to which the land improvement programs will be fulfilled and land fertility will be raised will depend on the rate of development of production and on growth of the effectiveness with which mineral fertilizers are used. The mineral fertilizer production sector faces the tasks of developing its mineral and raw material base, and particularly of developing the raw material base of phosphorus industry by expanding existing enterprises and enterprises utilizing the resources of new explored deposits of crude phosphorus. Effective development of phosphorus fertilizer production would be possible in the future only if we determine the sensible output capacity of new enterprises (and of reconstructed enterprises), if we work out the priorities for developing new deposits with regard for improving the territorial structure of the economy and transportation in the economic regions and for protecting the environment, and if we improve the production structure of phosphorus-containing products with regard for their predicted consumption in the form of phosphorus-containing fertilizers for farming, phosphorite meal, nutrient phosphates for livestock and phosphorus-containing products for developing export possibilities and other purposes.

Different variants of satisfying the demand for crude phosphorus based on the distribution of explored phosphorus reserves in the country can be considered when working out the basic directions for development of the production of phosphorus fertilizers in the future, with regard for their wide use.

The territorial structure of mineral fertilizer industry that has evolved is predetermined chiefly by the distribution of natural reserves of crude phosphorus, the bulk of which are concentrated in two of the country's economic regions. These are predominantly the apatite deposits of the Kola Peninsula, in the Far North of the European part of the country, and the phosphorite deposits of the Karatau basin in southern Kazakhstan. Forced development of these raw material bases over a long period of time caused the zone of their influence to widen continually, as a result of which irrational shipments of crude phosphorus and fertilizers increased. Rich ore was mined at a rapid pace, especially in shallow deposits. In a number of cases conditions promoting destruction and contamination of the natural environment were created, and a sizable fraction of the prepared reserves were lost in the subsoil.

The possibility for increasing production of crude phosphorus at existing enterprises came to be dependent to a greater degree on extraction of ore from deeper horizons, and the low ratio between open pit and underground mining worsened the basic technical and economic indicators in a number of cases, as a consequence of which the cost of mining a ton of useful material and the corrected outlays of the mineral fertilizer production sector increased. What is most important in this area is to select effective directions for development of the raw material base--ones which would reduce the negative consequences of unjustified expansion of production (carried out on an extensive basis) and of failure to account fully for transportation, ecological and other factors on one hand, and ones which would ensure improvement of the procedures for mining and processing crude phosphate, zonal distribution of production and utilization of this most valuable ingredient for raising the yield of cereal crops and increasing feed production on a sensible economic basis on the other.

The long-range significance of new phosphate deposits revealed in the country and the possibility of utilizing them as sources for development of phosphorus fertilizer industry must be considered in combination with expansion of the existing raw material base and with regard for the technical, economic, ecological and other factors limiting the scale and rate of growth of the mining and processing of phosphorus-containing raw material. If we are to prepare new operations for mining and processing crude phosphate and develop existing large-scale production operations today, we must concentrate attention on improving advanced procedures for mining and processing the ore; expanding full use and recycling of phosphorus-containing raw material and production wastes at a number of enterprises; using progressive production techniques and employing the latest phosphorus fertilizer application practices.

The raw material base thus far created and the crude phosphate reserves revealed in recent years at existing enterprises are making it possible to promote significant growth of the production of phosphorus fertilizers. While the country's revealed demand for phosphorus fertilizers has not been satisfied completely, this raw material base has been able to satisfy the bulk of this demand. Moreover it has promoted significant expansion of the regional possibilities for mining crude phosphate and producing mineral

fertilizers. Having enjoyed intensive development, the country's largest raw material bases of phosphorus industry will continue to play a leading role in satisfying the country's demand for phosphorus products, even though the rate of increase of raw material production is expected to be lower than that which has been achieved with lower production volumes. In addition to rebuilding the leading enterprises, we need to promptly prepare new raw material sources and expand existing ones, predominantly of local, regional significance. Considering the enormous scale of mining and a number of the objective difficulties involved with development of mining production, and particularly the need for consistently replacing capacities that are being depleted, the optimum solutions must be selected in the preplanning stage on the basis of a comparative economic assessment and a ranking of different raw material sources in terms of their cost and their aggregate corrected outlays, with regard for specific constraints and the factors of intensification.

The role of the principal facilities of the raw material base of phosphorus industry in the different regions of the country, the suitable directions of their future development with regard for positive and negative factors, and some of the economic conditions of production intensification are as follows.

The potentials of the raw material base of phosphorus industry are significant. In recent years geologists have discovered new, promising deposits, in addition to increasing the size of ore reserves in the vicinities of existing enterprises. New reserves of phosphorite were explored and confirmed by the USSR State Commission on Mineral Resources--the Gimmelfarbskoye deposit in Karatau, and Oleniy Ruchey in the Khibiny; the reserves at the Yukspor deposit, on the Rasvumchorr Plateau and in the Apatite Circus, which are being exploited by enterprises of the Apatit Production Association, were reevaluated; the reserves of iron-apatite ore in Kovdorskiy Rayon on the Kola Peninsula were expanded, and new apatite-bearing regions were revealed in the Ukraine and in the vicinity of the Baikal-Amur rail trunkline (East Siberia), and phosphorite deposits were revealed in the Central Kyzylkum Desert (Central Asia) and in the southern regions of Estonia. All of this is doubtlessly expanding the raw material base of existing enterprises, and it will make it possible to increase raw material extraction by rebuilding these enterprises. Construction of new apatite ore mining enterprises is planned at a number of newly explored deposits in accordance with the basic directions for the national economy's development.

It should be noted that in terms of the overall quantitative assessment, the ore reserves are fully in keeping with the planned level of production of phosphorus fertilizers. But the structure of the reserves and their distribution make up a complex pattern, considering their quality and the mining procedures that can be employed. Implementation of the planned programs for producing phosphorus products with regard for the time factor and the concrete mining and production conditions associated with developing a number of the apatite and phosphorite deposits will require significant capital investments, serious preparation and development of special measures

for improving mining and processing procedures employing new production systems and reagents, and serious improvement of planning operations.

Growth of the volume of raw material mined at existing enterprises on the Kola Peninsula is limited by the fact that a significant fraction of the deeply-lying reserves of newly explored ore deposits of the Khibiny group are being worked underground. In order to support, for example, some of the proposed variants for raising ore mining volumes with regard for depletion of open pit mines in the Apatit Production Association, the traditional approach would require that we increase underground ore extraction by not less than a factor of 2.5, which would be an extremely complex task for the enterprises, given the existing scale of ore extraction--50-60 million tons of ore per year. In this case the fixed productive capital of rebuilt mines must increase by around 3 or 4 times in the next two or three five-year plans, while the total productive capital of underground mines and the number of employees (in Arctic conditions) must increase by almost 7 times.

For such variants of production development to take place, scientific substantiations will have to be found, and constructive changes will have to be made in the ratio of underground to open pit mining in favor of the latter. They will also require development of improved procedures for mass ore extraction, design of highly productive equipment, wide use of continuously operating forms of mine transportation and creation of highly productive ore dressing systems.

The following should be treated as the most important directions of work in the future: reassessing the reserves with regard for the new parameters of open pit mining, the proportion of which must be increased; seeking solutions aimed at raising work mechanization and raising labor productivity; determining ways for expanding full utilization of raw materials--especially nepheline and other accompanying raw materials; deepening of their processing with the purpose of raising production profitability; reducing losses; organizing cooperative production on an intersector basis, and so on.

It is precisely in the large industrial regions, with their developed infrastructure and system of production ties between extracting and processing operations and with qualified personnel available, that the most important preconditions for intensifying production exist. It should be noted that the Kola region possesses sizable reserves of undeveloped low-iron apatite-containing ore. In terms of apatite quantity this ore is significantly superior to that found in a number of newly revealed deposits in other regions of the country. Unutilized ore in deposits of the Khibiny group presently being exploited and categorized as so-called noncontributing deposits are another sizable reserve. We do not presently have sufficiently firm criteria for determining the categories of ore. As an example ore containing less than 4 percent phosphorus pentoxide is classified in the Apatit Production Association as industrially unfeasible ore that does not contribute to total production, while almost the same kind of ore from the Oshurkovskoye deposit in the Transbaikal (3.6 percent) is categorized as industrially feasible. One would think that some fraction of noncontributing Khibiny ore could be characterized as industrially feasible, if it is processed and utilized in



the European part of the country with minimum outlays on transportation and enrichment. This is on the condition that this ore is mined by the more productive open pit method. Accepting ore with a lower concentration for processing would be natural to large, intensively developing mining enterprises. This practice must be forecasted by specialists establishing the optimum output capacity of an enterprise and its period of operation on the basis of the sum total of explored reserves, including future reserves and noncontributing ore. Besides raising lower categories to higher industrial categories in the course of operational exploration, work to reveal favorable parcels and to prepare for industrial development of noncontributing ore, and for its industrial and economic assessment in comparison with new, not yet developed deposits must continue.

Ore reserves accessible only through more complex and expensive underground extraction also occupy a large proportion in the Karatau basin. In this case if the phosphorite mining and processing volumes are to be increased in the future, we will have to clarify the quality of the ore with regard for the procedures employed and seek additional technological and economic grounds for determining the scale of development of enterprises in mining chemistry--the principal factors of intensification, the transportation factor, and the possibilities for supplying water to this industrial region. Economic assessment of phosphorus-containing products on the basis of existing wholesale prices shows that as the scale of production increases, and as low grade ore is utilized more widely, the profitability of the enterprises may decrease in the sector as a whole, and some will even begin operating at a loss, unless adequate measures are taken to improve the sector's structure, to bring the fertilizer production enterprises closer to the consumers, and to modernize them by implementing the accomplishments of scientific-technical progress and utilizing new methods of ore preparation and enrichment. At the same time the prices on phosphorus-containing products must be updated on the basis of the recorded indicators of the sector's principal enterprises and other installations included in the long-range balance, the outlays, and the impact enjoyed in the national economy; possible transportation needs and the outlays on introducing mineral fertilizers must be taken into account in this case. From our point of view introduction of zonally differentiated prices should play an important role in improving the technical and economic indicators of mining enterprises and stimulating development of the local raw material base. Although existing wholesale prices are stable, they do not reflect the actual outlays on mining the raw material and on production of concentrates and fertilizers, which places mining enterprises, which are scattered over enormous territories of the country, in unequally advantageous conditions, and which reduces their interest in intensifying production. Prices fulfill an important function by retarding growth of unjustified outlays only when they are in keeping with the concrete outlays of production. The wholesale prices on phosphorus-containing products have remained constant for a long time, and they evolved in different economic conditions. Consequently they cannot promote growth of the effectiveness of production and khozraschet, they make production losses possible, and in some cases they lead to subjective distortions in assessments of the conditions and factors associated with developing the deposits, to unjustified reduction of the cost of installations in the stage



in which the technical and economic grounds are determined, and to failure to account for the requirements of the laws on nature protection. This means that construction becomes more expensive, and the time it takes to introduce and develop our capacities grows longer. When we select the directions for development of the raw material base and phosphorus fertilizer production, we need to base the choice on the long-range structure of this base, the demands of product consumers and the suitability of importing phosphorus-containing raw materials and products (grain and so on). But it would be incorrect to reduce the problem of raising the effectiveness of mining production to just increasing wholesale prices on raw materials, which doubtlessly would be suitable in certain cases, and to development of only the larger facilities. Further improvement of the sector's territorial structure and extensive development of local raw material bases might improve the fertilizer production structure by increasing the volume of open pit mining, increasing the use of highly productive, progressive procedures and equipment, reducing transportation outlays and shipping losses, and expanding the use of fertilizers on highly productive, naturally watered ground, especially in the European part of the country, as well as in Siberia, Kazakhstan and the Volga region--that is, wherever an acute shortage of phosphorus fertilizers is felt.

According to the estimates of specialists, proper introduction of standard phosphorus fertilizers (1-2 centners per hectare) raises the yield of cereal crops by 2-3 centners and more, which means a significant savings of the state's real outlays in comparison with importing crude phosphorus and grain products, even if the prices on crude phosphorus are raised (to the level established by the USSR State Committee for Prices in relation to some of the least economical facilities included in the balance).

Besides production of phosphorus fertilizers, use of phosphorite meal and feed additives produced locally out of phosphorite ore from small deposits may have important significance to agricultural development of regions of industrial livestock breeding and to expansion of the production of cereal crops, especially corn, and alfalfa.

Natural distribution of raw material reserves in the following proportions relative to nationwide production would promote successful regional development of the production of phosphorus-containing mineral fertilizers: around 4 percent in the Central and Central Chernozem regions, 6 percent in the Volga-Vyatka region, over 5 percent in the East Siberian region, and 3 percent in the Estonian SSR. Intensification of the development of regional raw material bases is promoting better distribution of sulfur-containing raw materials suitable for production of mineral fertilizers, for the liming of soils and for other land improvement measures utilizing local raw materials and fertilizers; it is also promoting reduction of the radius of shipments, and the shipping losses.

It would be suitable to expand production of phosphorus-containing fertilizers, including by developing new raw material resources in the Ukraine (the Novopoltavskoye deposit) and in Kazakhstan (except for the principal deposits of the Karatau basin, and the Chilisayskoye and Bogdanovskoye

deposits in Aktyubinsk Oblast). Production of phosphorite meal with a concentration of up to 17 percent phosphorus pentoxide can be increased quickly at these deposits. The Fosfaty Production Association near Moscow, the Bryansk Phosphorite Plant, the Verkhnekamskiy and Toolseskiy mines, mines of Central Asia and the Transbaikal and enterprises of the Ural and Volga regions will enjoy further development.

In our opinion creating a dependable raw material base and developing production of phosphorus fertilizer in East Siberia and in the Far East is one of the main ways to improve the territorial structure of production of mineral phosphorus fertilizers and intensifying production. Optimum calculations carried out by various organizations and the structure of phosphorus fertilizer production and consumption that actually evolved generally confirmed the need for orienting the regions (especially those far away from Karatau and the Kola Peninsula) on using their own raw material base.

The country's eastern regions are less adequately supplied with fertilizers than the European part of the country and Kazakhstan. According to data of the state agrochemical service around 80 percent of all fields in the Ural and Far Eastern economic regions and around 50 percent of all fields in East Siberia have a low concentration of phosphorus, and when phosphorus is lacking, farming effectiveness declines. Even considering the existing yield levels in the Transurals, Siberia and the Far East, according to estimates by specialists each year several million tons of phosphorus pentoxide must be introduced into the soil after the harvest to replenish the phosphorus extracted by plants, while only 10 percent of this amount is actually introduced. The demand of East Siberia and the Far East for phosphorus mineral fertilizers is only 35 percent satisfied. Presently the ratio of mineral fertilizer production in the European part of the country, including the Urals, to that in the Asian part of the country is around 80:20. In the future this ratio must be changed to 70:30.

The apatite deposits in the Transbaikal, in the southern Yakutsk ASSR, Irkutsk Oblast and Altayskiy Kray must become the main potential sources of crude phosphorus for East Siberia and the Far East. In addition it would be suitable to study the possibility of developing, in the future, the phosphorite deposits of the Khibinskiy basin, located on contiguous territories of the USSR and Mongolia and close in ore type to phosphorites of the Karatau basin. Tentative estimates by geologists show that the predicted phosphorite reserves of this basin exceed the total reserves of known East Siberian deposits (Oshurkovskoye, Seligdarskoye etc.). The technical and economic indicators of most Siberian installations are close to the mean long-range raw material extraction and processing indicators for the sector (development of deep horizons of deposits in the Karatau basin and of the Apatit Association and forced utilization of poor ore from the Kola Peninsula and other regions in the future will cause a general decline in these indicators), and they should be interpreted as reserve deposits, to be included in the long-range raw material balance. The need for developing and intensifying agricultural production in eastern regions with regard for industrial development of the zone serviced by the Baikal-Amur Rail Trunkline requires that we supply phosphorus fertilizers to these regions as quickly as possible

and activate the efforts to create a major crude phosphorus base in the East and build mineral fertilizer plants in this area.

But at the same time, the problems concerned with development of the raw material base of phosphorus industry in Siberia are such that special technical and economic justification of such development is required. It would be incorrect to satisfy ourselves with the assertion of the fact that a number of crude phosphorus deposits have been found in this area. The Siberian deposits of apatite ore that have been revealed are distinguished by low quality (the concentration of phosphorus pentoxide is from 3.5 to 6 percent), by varying requirements on the procedures used to process the ore, and by complex natural conditions where this ore is located. Consequently if utilization of this ore is to be feasible with regard for environmental protection and other possible limitations, we would need to develop effective methods of mining and processing the ore, and we would need to adopt non-traditional design and production concepts that would promote improvement of the technical and economic indicators and quality of the product (growth of mechanization and automation of mine transportation with regard for using the minimum number of workers for hard jobs, wide use of highly productive equipment to process the ore, and extensive use of pipeline and other progressive forms of transportation). As an example measures to exclude the harmful effects of mining operations and of ore enrichment upon the surrounding natural environment and to protect the air and water basin against releases of dust and industrial liquid wastes have dominant significance to the Oshurkovskoye deposit, located in the Baikal basin. This can be done by establishing limits on the output of the enterprise and requiring mandatory removal of the enrichment factory and production wastes from the nature protection zone. Thus the factors limiting the scale and rate of growth of crude phosphorus mining and processing in the principal regions of its acquisition should be considered in relation to planned development of specific technical solutions for intensifying the use of this raw material.

Stiff requirements must be imposed in this case on sector scientific research and planning organizations and on institutes of the USSR Gosstroy and the State Committee for Science and Technology in regard to improving production plans and systems and eliminating routine approaches to production and construction practices.

Experience shows that the more deeply a facility is prepared and justified in the preplanning stage, the faster it is planned and built, and the more easily the planned output is achieved. The assistance of academy science in the stage of compiling the technical and economic justifications also produces a great impact.

Considering all of this, for the choice of the priority of construction of new facilities acquiring raw materials and producing phosphorus fertilizers to be correct (with regard for modern requirements on protecting the national environment and ensuring a fast return on capital investment), we need to base this choice on scientific calculations and on introduction of progressive equipment and procedures. When necessary, prices should be corrected with

regard for currency outlays on imported raw materials. Concurrently we need to determine the feasibility of developing industrial reserves of ore in low categories and, in some cases, of noncontributing ore. Development of large facilities requires meticulous study and assessment of the regional factors associated with their distribution, and particularly the consequences of creating a given production operation with regard for the reproduction structure of the region's economy.

Emphasizing the need for intensifying development of the raw material base and production of phosphorus fertilizers, we should attach priority (in terms of both organization and financing) to fuller utilization of raw materials, including fertilizers, and reducing their losses in all stages of production and consumption; we also need to take the fullest possible account of the reserves for raising the productivity of soil and protecting its fertility (using soil-conserving procedures and progressive crop growing techniques, as well as peat, lime etc.), we need to make more effective use of different forms of mineral fertilizers, and we need to utilize local resources--chiefly wastes containing phosphorus raw materials (phosphate slag, phosphorus-containing iron ore etc.).

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11004

CSO: 1841/575

## INORGANIC COMPOUNDS

### SYNTHESIS OF CRYSTALS FOR INDUSTRIAL TECHNOLOGY

Moscow MOSCOW NEWS in English No 22, 8-15 Jun 86, p 10

[Article titled "A Pipeline of Sapphire?" by Yevgeniy Novogradskiy]

[Text]

Researchers at the Shubnikov Institute of Crystallography of the USSR Academy of Sciences have come up with a unique procedure for twinning crystals in the solid phase. Now it has become possible to combine two or several crystals to form compounds of all sizes and shapes processing uniform mechanical, optical, dielectrical and semiconducting properties.

Modern instrument making and electronics require lots of new materials which can only be obtained through the processes of synthesis, the growing of crystals of required structure and shape. In most cases so far one can grow crystals of moderate sizes with preset properties. In the meantime, many devices require crystals of considerable size and intricate shape. To grow such crystals is impossible.

The Institute's researchers found an alternative after they had studied closely the works of N.F. Kazakov, D.Sc. (Technology). He was one of the designers and enthusiasts of the practical use of the so-called diffusion welding which allows for the joining together of cast iron and steel, ceramics and copper, titanium and aluminum and many more materials regardless of their individual properties.

Vladimir Govorkov, Cand. Sc. (Physics and Mathematics), had been the first to tackle a similar task of joining together crystals. The work later was continued by head of the lab of mechanical properties of crystals at the Institute of Crystallography, Vadim Regel, D.Sc. (Physics and Mathematics), and his associate, Yevgeny Stepanov, Cand. Sc. (Physics and Mathematics). The task proved to be even harder than that of joining together dissimilar metals or alloys. Indeed, there should be a strong and secure bond, while the transition layer between the crystals being joined should retain, unchanged, their electrical, physical, optical and other properties.

N.F. Kazakov's works have suggested to researchers the idea of attempting a solid-phase twinning in vacuum or an inert gas atmosphere.

After numerous experiments and thorough studies, the researchers found such modes of heating and compression forces which make the highly polished surfaces of two crystals twin and leave no traces of a joint between them. Using this procedure, the researchers obtained compounds of two or more crystals with uniform (including the twinning region) mechanical, optical, dielectrical and semiconducting properties.

The solid-phase twinning technique can now be used for a wide variety of crystals: semiconductors (silicon, germanium, boron, gallium arsenide), crystals for quantum electronics (ruby, sapphire, garnets, magnesium oxide, etc.), piezoelectric crystals (quartz, zinc oxide).

The technique widens the opportunities of instruments based on semiconductors. Electrical conduction of semiconductor crystals depends on their structure and types of admixtures. The presence of a single atom of a foreign matter per ten billion atoms of germanium appreciably alters its electrical conduction. Using various concentrations and types of admixtures, one can vary both conduction and its direction. This means that by introducing different admixtures into the same crystal, it is possible to create within it regions with different conduction--the electron conduction and the so-called hole-type conduction, which has a reverse direction. Correspondingly, junctions are formed between them. These junctions do the same as anodes and cathodes do in bulky vacuum tubes.

Electronic circuits on crystals are normally formed in crystallizers. But they are too thin and brittle to stand up to mechanical loads. At the same time, semiconductors for a number of devices have to be immune to such loads. And this is where the solid-phase method comes in. It has made possible the production of a silicon bicrystal with electron and hole-type conductivity by twinning an electron conductivity with a hole-type conductivity crystal. The bicrystal withstands great pressures and shocks.

Modern microelectronics increasingly relies on greater sensitivity and efficiency of components of electronic circuits using chips. And this, as we have already mentioned, largely depends on the crystal's purity, the integrated circuit's substrate, and on seeing to it that no foreign atoms get into the crystal. That posed production problems. One problem consisted in that you have got to treat the substrate thermally before forming an integrated circuit on a silicon chip. Until recently, integrated circuits were placed into containers of special quartz glass and then heated. Absolute purity cannot be achieved even inside such reliable containers. The quartz glass unavoidably released a certain quantity of oxygen atoms, which then polluted silicon chips, thus often impairing their electrical properties.

Now it has become possible to heat-treat silicon chips inside silicon containers which completely exclude chances of pollution. A silicon container consists of short lengths of artificially grown silicon tubes and a silicon bottom joined together by the solid-phase method.

The method also holds prospects for chemical engineering. A number of technological processes take place in highly corrosive media and at high temperatures, and many parts of equipment are manufactured from materials immune to heat and chemical agents. Using glass is the most obvious option, but glass is not strong enough for some processes. Using precious metals, platinum, for example, is a very costly proposition. It was found that a synthetic sapphire can be the answer. Low-cost and reliable pipes, tee-joints and other components of chemical equipment can be manufactured from synthetic sapphire using the technique of solid-phase joining.

The technique will prove very useful to jewellers. A crystal of magnesium oxide of green colour because of inclusions of cobalt, twinned with a zirconium oxide crystal of crimson colour because of inclusions of erbium, will form a bicrystal which, if faceted, will have an inimitable brilliancy.

Unparalleled anywhere in the world and being constantly improved, the new technique of producing crystal compounds will find many applications in various fields of the national economy.

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CSO: 1841



ORGANOPHOSPHORUS COMPOUNDS

UDC 542.91:547.1'127'118

SYNTHESIS OF AMMONIUM 1,3,2,5-DIOXABORATAPHOSPHORINANES (DBPP)

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 7, Jul 86 (manuscript received 24 Jan 85) pp 1641-1644

[Article by B.A. Arbuzov, O.A. Yerastov, G.N. Nikonov and A.A. Karasik, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan Branch, USSR Academy of Sciences]

[Abstract] Since the P and B atoms in P-C-O-B influence one another, further studies were conducted on the effects of the coordination of the P atom on the reactivity of the B atom by reacting bis(alpha-hydroxyalkyl)-phenylphosphines with isobutyl diphenylborate. In the presence of tertiary amines 2,2,5-triphenyl-4,6-p-DBPP were synthesized. Analysis of the products demonstrated that the nature of the radical affected the reaction pathways and the product structure. With strong electron acceptor substituents, the benzene moiety is either separated or the product is stabilized in the form of a complex. With donor substituents, a salt form is derived. References 6 (Russian).

12172/9716  
CSO: 1841/601

UDC 542.91:547.241'131:547.415.1

REACTION OF ETHYLDICHLOROPHOSPHINE (I) WITH N,N-DIBUTYL-2,3-BUTANEDIIMINE (II)

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 7, Jul 86 (manuscript received 7 Jan 86) p 1684

[Article by A.M. Kibardin, Yu.B. Mikhaylov, T.V. Gryaznova and A.N. Pudovik, Institute of Organic and Physical Chemistry imeni A.Ye. Arbuzov, Kazan Branch, USSR Academy of Sciences]

[Abstract] An analysis was conducted on the reaction of I and II under conditions avoiding hydrolysis and oxidation, resulting in the formation of 1,3-dibutyl-4,5-dimethyl-2-chloro-2-ethyl-1,3,2-diazaphosphonialene-4 chloride (III). Reaction of III with triethyloxonium boron fluoride led to



the synthesis of 1,3-dibutyl-4,5-dimethyl-2-chloro-2-ethyl-1,3,2-diazaphosphoniale-4 boron tetrafluoride. References 1 (Russian).

12172/9716  
CSO: 1841/601

UDC 541.138.2:547.241

#### ELECTROCHEMICAL SYNTHESIS OF DIFLUOROPHOSPHORANES

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 7, Jul 86 (manuscript received 12 Feb 86) pp 1686-1687

[Article by Ye.V. Nikitin, O.V. Parakin, Yu.A. Ignatyev, A.S. Romakhin, B.S. Mironov, I.P. Kosachev, G.V. Romanov, Yu.M. Kargin and A.N. Pudovik, Kazan State University imeni V.I. Ulyanov-Lenin; Institute of Organic and Physical Chemistry imeni A.Ye. Arbusov, Kazan Branch, USSR Academy of Sciences]

[Abstract] Reaction of tertiary phosphines ( $R_3P$ ) on a Pt electrode with a non-hygroscopic mono-n-amylamine fluoride ( $C_5H_{11}NH_3F$ ) in  $CH_3CN$  showed that a 3.3-6.7 mA/cm<sup>2</sup> current facilitated the synthesis of trialkyl(aryl) difluorophosphoranes ( $R_3PF_2$ ). The anodal oxidation can be depicted by the following equation:  $R_3P - 2e + 2C_5H_{11}NH_3F \rightarrow R_3PF_2 + 2C_5H_{11}NH_3^+$ .

12172/9716  
CSO: 1841/601

UDC 541.67:547.1'118

#### ELECTRICAL CHARACTERISTICS OF ADAMANTYLPHOSPHAETHINE ( $AdC\equiv P$ )

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 7, Jul 86 (manuscript received 4 Mar 86) p 1690

[Article by I.I. Patsanovskiy, E.A. Ishmayeva, Yu.Z. Stepanova, G. Bekker, V. Bekker, R. Knebl and A.N. Pudovik, Kazan State University imeni V.I. Ulyanov-Lenin; Institute of Inorganic Chemistry, Stuttgart University]

[Abstract] Determinations of the dipole moments and the molar Kerr constant of  $AdC\equiv P$  ( $M^+178.0$ ;  $mt$  69-70°C) yielded values of  $1.58 \pm 0.05$  D and  $11 \times 10^{-11}$  esu, respectively, at 25°C in Ar. The polarity of the  $P\equiv C$  was calculated at  $0.46 \pm 0.05$  D, with IR spectra showing vibration at 1528  $cm^{-1}$ , and  $b_L$  found to be 8.07 Å. References 2: 1 Russian, 1 Western.

12172/9716  
CSO: 1841/601

## PHOSPHORYLATED ADAMANTANES. PART 6. REACTION OF 1-ADAMANTYLETHYLPHOSPHITES WITH PHOSPHORUS TRICHLORIDE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 5, May 86 (manuscript received 13 Feb 85) pp 1044-1046

[Article by R.I. Yurchenko and T.I. Klepa, Institute of Organic Chemistry, Ukrainian SSR Academy of Sciences]

[Abstract] It has been suggested that disproportionation of phosphites on reaction with  $\text{PCl}_3$  may proceed by one of two routes: either via formation of a P-P bond followed by Cl atom/alkoxyl group exchange, or by coordination of the alkoxyl group O atom by the P atom of the  $\text{PCl}_3$  and oxonium group/Cl atom exchange.  $^{31}\text{P}$  NMR studies on the reaction of di-1-adamantylethylphosphite with  $\text{PCl}_3$  resulted in the synthesis of a complex mixture of products, which did not include the expected di-1-adamantylchlorophosphite and ethyldichlorophosphite. However, after 15 min of reaction, the products were identified as ethyldichlorophosphite, 1-adamantylchlorophosphite, 1-adamantylethylchlorophosphite, diethylchlorophosphite, and presumably di-1-adamantylchlorophosphite. These observations were consonant with the view that the reaction of mixed phosphites with  $\text{PCl}_3$  proceeds with the formation of products representing Cl atom displacement by both less and more nucleophilic alkoxyl groups. References 7: 6 Russian, 1 Western.

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CSO: 1841/600

UDC 547.438.1+547.442.4

## REACTION OF 1,4-DIKETONES WITH PHENYLPHOSPHINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 5, May 86 (manuscript received 18 Mar 85) pp 1046-1051

[Article by V.I. Vysotskiy and M.F. Rostovskaya, Far Eastern State University, Vladivostok]

[Abstract] Detailed studies are presented on the reactions between 1,4-diketones and phenylphosphine, a set of previously uninvestigated reactions. The reactions were carried out in the presence of HCl in dioxane, yielding 2-hydroxy-1-oxo-1-phenylphospholanes as the primary products. The formation of the phospholanes was visualized as the addition of phenylphosphine to the carbonyl groups of the diketones, and subsequent hydroxyphosphine-phosphinoyl rearrangement of intermediate 2,5-dihydroxy-1-phenylphospholanes. The products represent a series of spatial and positional isomers, of which the one with the highest melting point predominates. On melting, several of the minor products undergo transformation into the more stable isomer. References 11: 6 Russian, 5 Western.

12172/9716  
CSO: 1841/600

## INTERACTION OF ALPHA-PHOSPHORYLATED CARBONYL COMPOUNDS WITH AMINOALCOHOLS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 5, May 86 (manuscript received 28 Nov 84) pp 1051-1053

[Article by V. V. Moskva, T.Sh. Sitdikova, T.V. Zyкова, M.V. Alparova and F.Sh. Shagvaleev, Kazan Institute of Chemical Technology imeni S.M. Kirov]

[Abstract] Studies were conducted on the reaction of a series of amino-alcohols with either phosphorylated acetaldehyde or acetone, which demonstrated that in both cases only enamines were formed (NMR failed to detect either oxazolidines or azomethines). Specifically, condensations involving aminoethanol and 3-aminopropanol yielded phosphorylated N-(hydroalkyl) alkenylamines. NMR spectroscopy demonstrated the predominance of E-isomers in the case of products formed with acetaldehyde, and both E- and Z-forms in the reactions with acetone. References 5: 3 Russian, 2 Western.

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CSO: 1841/600

## SYNTHESIS AND PHYSICOCHEMICAL STUDIES ON N-ALKYLENE-(ARYLENE)PHOSPHONIUM DERIVATIVES OF QUINOLINE

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 5, May 86 (manuscript received 5 Jun 85) pp 1069-1073

[Article by L.Ye. Zhivoglazova, V.Ye. Pridan and M.I. Shevchuk, Chernovtsy State University]

[Abstract] N-alkyne(arylene)phosphonium derivatized quinolines were synthesized by N-alkylation of quinaldine and lepidine by phosphonium salts with the following general formula:  $\text{Br}-\text{R}-\text{P}^+(\text{C}_6\text{H}_5)_3\text{Br}^-$ . The salt was reacted with a small excess of the heterocyclic compound in DMFA at 120-130°C for 1.5-2.0 h. Quinaldine was found to react poorly in such condensations, presumably because of spatial considerations, giving lower yields of the diquaternary salts. However, the yield was enhanced by polar solvents. Further studies on the products made use of classic styryl condensation to determine the reactivity of the methyl groups and elucidate the effects of the N-alkylene(arylene)phosphonium group on the mobility of the hydrogen atoms of the active centers. Evaluation of kinetic and thermodynamic constants demonstrated that the diquaternary salts were less reactive by an order of magnitude than analogous monoquaternary salts. However, the quinaldine salts were more reactive than those of lepidine. References 12: 7 Russian, 5 Western.

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CSO: 1841/600

## SYNTHESIS OF HEXACHLOROCYCLOTRIPHOSPHAZENE DERIVATIVES WITH 5-HYDROXY-TRYPTAMINE

Leningrad ZHURHAL OBSHCHEY KHIMII in Russian Vol 56, No 5, May 86 (manuscript received 22 Apr 85) pp 1073-1076

[Article by G.V. Popova, M.G. Alapishvili, Ye.D. Vorontsov, V.V. Kireyev and N.N. Suvorov]

[Abstract] Studies were conducted on the reaction of hexachlorocyclotriphosphazene with sodium and lithium salts of 5-hydroxytryptamine. Using a trityl group for the protection of the amino group on 5-hydroxytryptamine,  $n = 1$  and 3 degrees of substitution of Cl atoms on the phosphazene by N-trityl-5-hydroxytryptamine were obtained. The specific compounds synthesized were 5-O-(N-trityl-oxytryptamino)pentachlorocyclotriphosphazene, tris[5-O-(N-trityloxytryptamino)]trichlorocyclophosphazene, and 5-O-(N-trityloxytryptamino)pentachlorocyclotriphosphazene. References 6: 4 Russian, 2 Western.

12172/9716

CSO: 1841/600

## TWO REACTION ROUTES OF PHOSPHORIC ACID HYDRAZIDES WITH p-BENZOQUINONES

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 5, May 86 (manuscript received 9 Jul 85) pp 1185-1186

[Article by A.A. Kutyrev and V.V. Moskva, Kazan Institute of Chemical Technology]

[Abstract] Reaction of O,O-dialkylphosphate hydrazides with 1,4-benzoquinone and 2-chloro-1,4-benzoquinone takes place at room temperature with the formation of quinhydrone and a dialkylphosphite after release of gaseous nitrogen. At 0-5°C in an apolar solvent such as benzene and a reactant concentration of 0.2 M or less, the primary product is N,N-bis(O,O-dialkylphosphato)dihydrazone-2-X-1,4-benzoquinone, with X = H or Cl. References 2: 1 Russian, 1 Western.

12172/9716

CSO: 1841/600

## SYNTHESIS OF PHOSPHAALKENES BY REACTION OF 2,4,6-TRI(TERT-BUTYL)-PHENYLPHOSPHINE (I) WITH CARBONYL COMPOUNDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 5, May 86 (manuscript received 12 Jul 85) pp 1186-1187

[Article by V.D. Romanenko, A.V. Ruban, M.I. Povolotskiy, L.K. Polyachenko and L.N. Markovskiy, Institute of Organic Chemistry, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Synthesis of phosphaaalkenes was achieved by the reaction of I with fluorenone, benzaldehyde and 2,4-dimethoxybenzaldehyde, catalyzed by  $\text{BF}_3 \cdot \text{Et}_2\text{O}$ . Such an approach yielded the following respective condensation products in high yields (66-75%): P-[2,4,6-tri(tert-butyl)phenyl]fluorenylidene phosphine. P-[2,4,6-tri(tert-butyl)-phenyl]-C-phenyl-methylenephosphine, and P-[2,4,6-tri(tert-butyl)-phenyl]-C-2,4-dimethoxyphenyl-methylenephosphine. References 2: 1 Russian, 1 Western.

12172/9716  
CSO: 1841/600

## LAWESSON REAGENT IN ORGANOPHOSPHORUS SYNTHESIS. PART 1. PREPARATION OF DIALKYLTHIOPHOSPHOROUS AND THIOPHOSPHONIC ACIDS

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 5, May 86 (manuscript received 6 May 85) pp 1189-1190

[Article by N.G. Zabirow, R.A. Cherkasov and A.N. Pudovik, Kazan State University imeni V.I. Ulyanov-Lenin]

[Abstract] A one-step method has been devised for the transformation of dialkylphosphorous or phosphonic acids into the corresponding thioacids by reaction with Lawesson reagent (2,4-di(p-methoxyphenyl)-2,4-dithiono-1,3,2,4-dithiodiphosphonate). The reactions were conducted by mixing the reactants in benzene for 1-2.5 h, forming the thioacids in yields of 50-80.5%. In the reaction process the Lawesson reagent underwent transformation into 1,3,5-trioxa-2,4,6-trithio-2,4,6-tris(p-methoxyphenyl)-2,4,6-triphosphorinane. References 5: 1 Polish, 2 Russian, 2 Western.

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PHOSPHORYLATION OF IMIDATES BY TODD-ATHERTON REACTION

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 5, May 86 (manuscript received 24 Jun 85) pp 1192-1193

[Article by B.I. No, V.Ye. Shishkin, Yu.M. Yikhno, Ye.V. Mednikov, S.V. Ufimtsev and S.I. Maykov, Volgograd Polytechnic Institute]

[Abstract] The first use of the Todd-Atherton reaction for phosphorylation of imidates is described. The reagents, used in a ratio of imidate: triethylamine:dialkylphosphite:carbon tetrachloride = 1:1.1:1:7, were reacted for 6-7 h at 10-15°C, with final isolation of the target product by silica gel column chromatography with 2-propanol:methanol (100:1). References 3 (Russian).

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UDC 547.26'118

STRUCTURE OF TRIS(2,2,3,3-TETRAFLUOROPROPOXY)DICYANOPHOSPHORANE (I)

Leningrad ZHURNAL OBSHCHEY KHIMII in Russian Vol 56, No 5, May 85 (manuscript received 15 Aug 85) p 1193

[Article by Yu.G. Shermolovich, N.P. Kolesnik, S.V. Iksanova, V.V. Trachevskiy and L.N. Markovskiy, Institute of Organic Chemistry, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] <sup>13</sup>C NMR studies were conducted at -50°C on I to define its structural parameters. The spectroscopic data indicated that at low temperatures I exists in the form of a trigonal bipyramid. Two polyfluoroalkoxyl groups occupy apical positions, while one polyfluoroalkoxyl and two nitrile groups occupy equatorial positions. References 2: 1 Russian, 1 Western.

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## PETROLEUM PROCESSING INDUSTRY

### CONSTRUCTION OF AKSARAYSK GAS-CONDENSATE REFINERY

Moscow IZVESTIYA in Russian 16 Jun 86 p 2

[Article by N. Rybakov: "Beneath the Desert Sun"]

[Text] The work is humming along beneath the white sun. A huge industrial complex refining a unique natural raw material--gas condensate--is being erected in the arid sandy steppes near Astrakhan. Commercial gas, automotive gasoline, sulfur, fuel oil and other petroleum products will begin to be made from this raw material at the end of this year.

As with all other organizations, subdivisions of the USSR Ministry of Installation and Special Construction Work must work in extreme natural conditions. At times the storm winds cause the dunes to shift, while when the winds die down the mercury climbs to plus forty degrees.

"But these are all trifles in comparison with the capricious nature of the gas condensate itself," says electrician brigade leader K. Tyulyupov. "This is an insidious, explosive substance. We the installers bear high responsibility. The higher the quality of our work, the more confidently those who will be servicing this enterprise will feel."

Not only highly qualified installers but also young men who have decided to take part in this work, so important to the country, are coming here to the Aksaraysk construction site. They must be taught the ropes of installation quickly and flawlessly. Moscow specialists from the All-Union NIIProyektelektromontazh (VNIIPPEM) [not further identified] Institute took on the job of solving this problem. The scientific workers did not limit themselves, as still happens frequently, to publishing guidelines and instructions--to paperwork in short.

Many associates of the institute visited Aksaraysk--a settlement which is still not on the map. Having created the necessary conditions for learning the subtleties of an electrician's work there, each day they conduct lectures, seminars and practical lessons. Dozens of brigade leaders convene in the technical office before the start of a shift. Here they receive qualified briefings from the scientific workers, and they delve into the fine points of the day's forthcoming work. Thus the entire Aksaraysk Administration of the Nizhnevolgoelektromontazh Trust undergoes training.

K. Matveyev, the administration's chief engineer, has this to say:

"Instructor specialists from the VNIIPeM are always present at the construction site, ready at any moment to provide assistance to each of our installers with valuable advice. The results are obvious as well. The installers have become more competent in reading the drawings, and sometimes they are able to reveal certain inaccuracies made by the planners before it is too late."

11004

CSO: 1841/588



## OIL REFINERY CONSTRUCTION PROBLEMS

Riga SOVETSKAYA LITVA in Russian 24 Jun 86 p 1

[Interview with A. Norkyavichyus, chief engineer, Mazeikiai Construction Trust, V. Kubyshkin, chief engineer, Baltic Specialized Installation Administration, and E. Shimkus, chief, Capital Construction Division, Mazeikiai Oil Refinery, by correspondent S. Skabeykis; date and place not specified: "Problems Require Solution"]

[Text] The complex for intensive oil refining presently under construction at the Mazeikiai Oil Refinery will make it possible to increase production of gasoline and diesel fuel significantly--by a third. It consists of two generations, the first of which is to be placed into operation in 1988. The volume of construction and installation for the first generation is 42 million rubles. Last year, the year in which the work began, the Mazeikiai Construction Trust--the general contractor--assimilated around 6 million rubles here, which was 200,000 more than planned. The work is still proceeding at full steam.

What is to be done this year? What difficulties are standing in the way of successfully completing the assigned tasks? Our part-time correspondent S. Skabeykis asked these questions of the participants and client of this huge construction project.

[Norkyavichyus] This year we need to complete twice more general contracting work than last year--11.6 million rubles more. A reasonably good foundation has been created for this. All underground utility lines have been laid, 80 percent of the roads have been built, and the work front of the intershop utility lines has been prepared for installers of the Prommontazh Trust. The main task this year is to prepare all of the main pedestals, production installations, air and gas compressor stations and transformer substations for installation. There is a great deal of work to do, and it will be difficult to finish it on our own. And yet, the republic's Ministry of Construction is providing almost no help to us at all. The supply conveyor is still not working smoothly. The Vilnius Metalas Production Association is perpetually late in deliveries of metallic structures. Deliveries of

reinforced concrete framing articles from the plants--the Vilnius Reinforced Concrete Structures Plant No 3 and the Kaunass Reinforced Concrete Structures Plant No 3--also leave something to be desired.

And the client--the oil refinery--is doing a poor job of supplying us with stainless steel and with control fittings.

[Kubysshkin] In four years the total volume of our work in support of erection of the intensive oil refining complex, which is the refinery's third generation, must be 10 million rubles. Last year we assimilated around 700,000, and the plan for this year is around a million and a half rubles. We could have done more last year, and this year we have the capacity to assimilate significantly larger assets, but the plan does not foresee this. This means that in the future, and especially in the year in which operation is to begin, we will have to fight a battle to finish, just as happened with the first two generations. Is this the way to run a business? Is this the way to plan things? I feel that both the client and the USSR Ministry of Petroleum Refining and Petrochemical Industry should put an end to this kind of planning practice, which in the end forces us to step up the work pace to get the job done. It is time to start working in a new way. Planning must be organized in such a way that we could work at full strength throughout the entire time of construction of the third generation.

To erect the refinery's third generation, we on our part improved the industrial base and took the trouble to get new equipment controlled by computers and industrial television. But we do not know yet when all of this will go into operation at full power. For example we need to install several heavy structures. And when are we supposed to do this? The client has still not come up with a delivery schedule. As far as I know, the refinery will shortly receive all equipment for the hydrogen installations, but the installation paperwork is still unavailable.

[Shimkus] At the moment we have planning documents for a construction volume of only 34 million rubles. Because of the absence of these documents the builders cannot work efficiently and consistently. Planners of the Grozgiptoneftekhim Institute keep making changes in the documents rather often. For example they revised the drawings for the storm drains five times. Many other corrections were made as well. We should finally receive a schedule this quarter for deliveries of oversized equipment, and installation documents pertaining to the hydrogen installations. As the scope of construction increases, the number of participants will increase. This means that they will have to be housed somewhere, and their food services and leisure time will have to be organized. This, after all, concerns not only the general contractor but us as well. We are sharing in the work, and that means we must share the concerns.

The scope of erection of the third generation of the oil refinery is widening from one day to the next. The appearance of the construction site changes practically daily. More metallic structures and various machine units are appearing. The work is proceeding at full steam,

and it is all the more important to resolve, as quickly as possible, all of the disputes and problems which are still restraining successful movement forward.

11004

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## NEW GAS-CONDENSATE DEPOSIT IN ORENBURG OBLAST

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 11 Jul 86 p 1

[Article by Ye. Khmelevskiy, Orenburg: "A New Deposit"]

[Text] New beds of gas-condensate were discovered at a depth of around 5,000 meters in Pervomayskiy Rayon, Orenburg Oblast. The new deposit was discovered by the brigade led by Hero of Socialist Labor, USSR State Prize Laureate A. Zhukov from the Buzuluk Petroleum and Gas Exploration Expedition. The huge fountain of gas-condensate escaping from the drilled well was tamed by A. Nafikov's development brigade.

The new deposit was named Vishnevskoye. It is a significant supplement to the rayon's geological map, and it confirmed the predictions of scientists that large beds of hydrocarbons would be found in Devonian strata of the southwestern part of Orenburg Oblast.

Also important is the fact that the new deposit is located in inhabited regions. Oil and gas pipelines pass through this area, and major drilling organizations are present. This makes it possible to count on sending raw material from the new deposit to refineries this very year.

11004

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UDC 655.753.2.038

EFFECTS OF MONOESTERS OF DICARBOXYLIC ACIDS ON ANTIWEAR PROPERTIES OF JET FUEL

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 6, Jun 86 pp 16-18

[Article by A.S. Kislenko, I.F. Krylov, G.I. Sokolova, V.P. Seregin and G.B. Skovorodin, Moscow Institute of Petroleum imeni I.M. Gubkin]

[Abstract] Monoesters of dicarboxylic acids were synthesized and tested for their antiwear properties in jet fuel, since dicarboxylic acids themselves are virtually insoluble in jet fuel. The compounds tested consisted of esters prepared from dicarboxylic acids with up to 20 C atoms in the chain, and aliphatic alcohols with 7 to 16 C atoms. Added in a concentration of 0.15 moles/m<sup>3</sup>, they had a protective effect 3- to 4-fold greater than that of the conventional additive K. The effectiveness of the individual esters was directly correlated with their adsorption to metal surface and lack of desorption by hydrocarbon solvents and even activated charcoal. Monoesters of dicarboxylic acids represent a class of compounds showing promise as efficient antiwear agents in hydrofined jet fuel. Figures 3; references 7 (Russian).

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CSO: 1841/583

UDC 665.765-404.028.2

HIGHLY ALKALINE ALKYLTOLUENE-BASED SULFONATE ADDITIVE FOR ENGINE OILS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 6, Jun 86 pp 18-19

[Article by K.I. Sadykhov, A.N. Agayev, S.M. Veliyeva and I.D. Kulaliyev, Institute of Chemistry of Additives, Azerbaijan SSR Academy of Sciences]

[Abstract] An alkyltoluene-based sulfonate additive for engine oils was prepared by sulfonation of the alkyltoluene by gaseous sulfur dioxide and subsequent neutralization with calcium hydroxide. Treatment of the neutral sulfonate by carbon dioxide in the presence of excess calcium hydroxide, methanol promoter, M-6 oil diluent, and toluene solvent produced a highly alkaline additive designated as IKhP-223. In trials with oil M-10G<sub>2</sub>, IKhP-223 imparted the same resistance to corrosion and wear as conventional additive

PMS-A and exceeded the latter in its detergent properties. These observations indicate that an alkyltoluene-based sulfonate additive has potential for use in heavy-demand conditions, with the alkyltoluene readily prepared by alkylation of the toluene fraction of  $C_{20}$ - $C_{28}$  alpha-olefins. References 3 (Russian).

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CSO: 1841/583

UDC 547.431.5:621.892

## 2,2,6,6-TETRAMETHYLOLCYCLOHEXANOL ESTERS AS LUBRICATING OIL BASES

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 6, Jun 86 pp 20-21

[Article by M.A. Mamedyarov, F.T. Seyidov and G.N. Gurbanov, Institute of Petrochemical Processes imeni Yu.G. Mamedaliyev, Azerbaijan SSR Academy of Sciences]

[Abstract] A series of esters of 2,2,6,6,-tetramethylolcyclohexanol (TMCH) were synthesized using  $C_3$ - $C_8$  monocarboxylic acids and synthetic  $C_5$ - $C_6$  fatty acids and tested for utility as lubricating oil bases. The esters possessed high viscosity at 100°C (6.76-10.44 mm<sup>2</sup>/sec), high flash points (236-300°C), low congealing temperatures (-50 to -36°C), and other favorable characteristics. In addition, the selected esters of TMCH were shown to be resistant to thermooxidative destruction (thin film exposure to 200°C for 10 h) and non-corrosive with respect to AK4 aluminum, and slightly corrosive with respect to ShKh15 steel. The preliminary studies show that some of the TMCH esters have obvious potential as lubricating oil bases. References 4 (Russian).

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UDC 658.562:621.89:543.54

## LIQUID AND GAS-LIQUID ANALYSIS OF AVIATION LUBRICATING OILS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 6, Jun 86 pp 24-26

[Article by G.G. Kholostova, V.N. Bakunin and S.G. Shimonayev]

[Abstract] Liquid and gas-liquid chromatographic techniques were employed in conjunction with standard analytical methods used in evaluating lubricating oils, in order to provide information on changes in the molecular composition resulting from heat exposure. The studies were conducted with esters formed from pentaerythritol and synthetic  $C_5$ - $C_9$  fatty acids, using DAT and FAN antioxidants and temperatures of 200-250°C for 10-50 h. Tabular and graphical summaries are presented of the results, demonstrating that in the absence of antioxidants the esters were highly susceptible to thermooxidative destruction. An exponential equation was derived relating the viscosity of the esters to the degree of their transformation as a result of oxidation, which may be used

to estimate the useful service life of lubricating oils based on such esters. Figures 3; references 5: 4 Russian, 1 Western.

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CSO: 1841/583

UDC 665.766-404.038.2:543.544

#### QUALITY CONTROL OF DETERSOL-TYPE ALKYL SALICYLATE OIL ADDITIVES

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 6, Jun 86 pp 35-36

[Article by V.A. Zakupra, Yu.A. Mikhaylov, P.L. Klimenko, L.M. Petrenko, N.L. Voloshin and M.A. Dmitruk, All-Union Scientific Research Institute of PK [expansion unknown] of Petrochemistry]

[Abstract] A microchromatographic method has been developed for use in quality control of Detersol-type alkyl salicylate oil additives. The systems involved using a 350 mm glass column, 3.5 mm in diameter, filled with KSK-1 silica gel as the first phase in the separation. The KSK-1 silica gel (7.5-12 nm mean pore radius) is pretreated with hydrochloric acid and water, activated at 150°C for 6 h, and then treated with 2 wt%  $\text{CaCO}_3$ . The second segment consists of a 230 mm phase of ASKG silica gel treated with 2 wt%  $\text{CaCO}_3$  and then activated. Finally, the bottom portion consists of a 20 mm holding layer of ASKG silica gel. IR spectroscopy of the eluted fractions demonstrated that complete separation of the additive components is obtained. The oil hydrocarbons are eluted with n-hexane, alkyl phenols with chloroform; the calcium alkyl salicylates are eluted by 96% ethanol. References 6 (Russian).

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UDC 66.063.726:547.913

#### DIALKYL PHTHALATE-BASED SYNTHETIC OILS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 6, Jun 86 pp 38-39

[Article by A.I. Akhmedov, E.U. Isakov, D.M. Tairova and R.I. Ibragimova, Institute of Chemistry of Additives, Azerbaijan SSR Academy of Sciences]

[Abstract] In order to expand the base for synthetic oils, an evaluation was conducted on dialkyl phthalates in view of their relatively inexpensive production methods. Comparative analysis of a series of dialkyl phthalates, pentaerythritol esters, and dialkyl sebacinate in terms of viscosity, flash points, congealing points, etc., demonstrated that several dialkyl phthalates have potential as synthetic oils. Of particular interest in this respect is diheptyl phthalate with a viscosity of 3.23  $\text{mm}^2/\text{sec}$  at 100°C, a flash point of 205°C, and a congealing point of -60°C. With the appropriate thickening agents, such as polymethacrylates, the viscosity could be adjusted to that required for aviation oils (5-8  $\text{mm}^2/\text{sec}$  at 100°C). The high thermal stability

of the dialky phthalates (due to the presence of an aromatic nucleus in the molecule) and their ease of preparation and production suggests their utility in lubricating oils. References 2 (Russian).

12172/9716  
CSO: 1841/583

UDC 665.753.4.035

#### PRODUCTION AND USE OF LOW POUR POINT DIESEL FUELS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 5, May 86 pp 2-4

[Article by B.A. Englin, T.N. Mitusova, T.N. Veretennikova and V.S. Azev]

[Abstract] A brief review is presented of Soviet and Western practices in the production of low-pour-point diesel fuels. In the USSR the most widely used pour-point depressant is TU 38 10189-81, which allows the use of summer diesel fuel in the ambient temperature range of  $-15$  to  $-20^{\circ}\text{C}$  prevalent in Ukraine, Belorussia, Moldavia and the Baltic Republics in the winter months. The use of pour-point depressants is limited by the cloud point, which has led to the development of depressants that lower both the pour and the cloud points. In the presence of relatively low concentrations of n-paraffins the cloud point can be reduced by  $10-15^{\circ}\text{C}$  by depressants that increase the solubility of the n-paraffins or by forming soluble complexes with them. Surfactant depressants can modify the crystalline structures of paraffins at low temperatures in such a manner as to prevent their growth and aggregation. Depressants with surfactant properties are particularly useful when the difference between the cloud point and filtrability point of a fuel exceeds  $10^{\circ}\text{C}$ . References 1 (Russian).

12172/9716  
CSO: 1841/582

UDC 621.436:621.892.004.18

#### OIL CONSUMPTION IN DIESEL ENGINES

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 5, May 86 pp 4-6

[Article by E.P. Vol'skiy, V.I. Vorozhikhina, L.S. Ryazanov and V.T. Tkachev, Dispatch Yard, Kolomna Plant]

[Abstract] A mathematical analysis was conducted on oil consumption by diesel engines, based on the following fundamental equation:  $g_t = g_y + (Q/\tau)$ , where  $g_t$  represents total oil consumption,  $g_y$  represents oil loss due to combustion,  $Q$  is equal to the volume of oil drained in a change, and  $\tau$  is the time elapsed between oil changes. It is evident that the cost effectiveness of a diesel engine in terms of oil consumption is determined by the time between oil changes, as well as oil loss due to combustion. Total oil consumption was inversely related to oil quality, i.e., the higher the quality the less oil consumed, oil combustion being equal. Figures 4; references 3 (Russian).

12172/9716  
CSO: 1841/582



## EFFECTS OF CHEMICAL AND ULTRASONIC TREATMENT ON LUBRICATING CHARACTERISTICS OF OILS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 5, May 86 pp 23-25

[Article by A.S. Kuzharov, V.V. Suchkov and L.A. Vlasenko, Novocherkassk Polytechnic Institute imeni Sergo Ordzhonikidze]

[Abstract] An analysis was conducted on the use of copper powder (ca.10%; PMS, 10-50  $\mu$ m particles) and ultrasonication (15-35 kHz, 20-50 W/cm; 1-5 h) with and without conventional oil additives on the tribologic characteristics of lubricating oils. Evaluations conducted with bronze-steel and steel-steel friction measuring systems demonstrated that metal wear was reduced in the various oil systems, particularly in the presence of surfactants. The effectiveness of the latter type of oil treatment was attributed to complex formation with copper or its compounds. For each oil an optimal system of additives in combination with ultrasonication can be devised to minimize metal wear. References 9: 8 Russian, 1 Western.

12172/9716  
CSO: 1841/582

## COMPATIBILITY OF ADDITIVE IKhP-234 WITH CORROSION INHIBITORS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 5, May 86 pp 25-26

[Article by A.B. Kuliyeu, G.I. Imanova and F.A. Kuliev, Institute of Chemical Additives, Azerbaijan SSR Academy of Sciences]

[Abstract] An evaluation was conducted on the compatibility of the thickening additive IKhP-234 with various corrosion inhibitors. In the case of oil I-12A containing 8% IKhP-234 the optimal concentrations of the inhibitors IKhP-21, DF-11 and thioamide were, respectively, 3, 1.5 and 1 wt%. Thioamide, which appears to have universal usefulness in a variety of oils, can be used in the development of more advanced motor, transmission, and hydraulic oils. References 3 (Russian).

12172/9716  
CSO: 1841/582

## DEPRESSANT ACTIVITY OF ETHYLENE-VINYL ACETATE COPOLYMERS IN DIESEL FUEL

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 5, May 86 pp 29-31

[Article by A.P. Dushechkin, V.I. Ivanov, A.L. Yelagin and A.A. Levin, All-Union Scientific Research Institute of Oil Refining]

[Abstract] Ethylene-vinyl acetate (EVA) copolymers were tested for their efficacy as depressants of filterability and pour points of diesel fuel L in relation to the degree of branching of the copolymer. Trials with fuel samples containing 0.05 wt% EVA demonstrated that copolymers with the lower degree of branching were more effective in depressing the filterability temperature; increasing the degree of branching to 9-15 led to a reduction in activity, while copolymers with a degree of branching of 15 were entirely ineffective. EVA copolymers with a degree of branching of 9-12 showed maximum pour point depression, with the activity falling off with more or less branching. On the whole, maximum activity as depressants with respect to filterability and pour points was shown by EVA copolymers with a degree of branching not exceeding 10. Whenever depression of the pour point is the dominant demand, copolymers with degrees of branching of 9-12 may be utilized in diesel fuel. Figures 1; references 6 (Russian).

12172/9716

CSO: 1841/582

UDC 621.892:620.193.001.5

## METHOD FOR DETERMINING CORROSIVE ACTIVITY OF MOTOR OILS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 5, May 86 pp 37-38

[Article by A.I. Kirsanov, N.T. Krivoruchenko and T.A. Mazayeva]

[Abstract] A method was devised for testing motor oils for corrosive activity on metals, relying on the use of AP-1 testing apparatus at 180°C and a lead strip from which the oxide film has been removed. After 50 h of testing, mineral oils were found to yield a level of corrosion approaching 10 g/m<sup>2</sup>, semisynthetic oils a level between 10 and 25 g/m<sup>2</sup>, and synthetic oils in excess of 25 g/m<sup>2</sup>. These levels differ from those provided by 500 h of motor testing in being significantly greater, and point to the fact that group B<sub>2</sub> motor oils can be tested under laboratory conditions. References 5 (Russian).

12172/9716

CSO: 1841/582

## QUALITY CONTROL METHODS FOR CLOCK AND INSTRUMENT OILS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 5, May 86 pp 44-46

[Article by A.V. Vilenkin and P.A. Kalinin]

[Abstract] A brief survey is presented of the standard approaches in the West and the USSR to assure quality control of lubricating oils used in instruments and jewel bearings. These include determinations of tribological characteristics, tolerance of moisture and various temperature extremes, resistance to oxidation and hydrolysis under various climatic conditions, flash points, and susceptibility to biodegradation. It is only through careful testing and the setting of rigid standards that oils intended for fine instruments can meet the stresses of exposure to tangential forces under a variety of climatic exposures. References 13: 6 Russian, 7 Western.

12172/9716

CSO: 1841/582

UDC 665.637.6:665.66

## EFFECTS OF EXTENSIVE PURIFICATION ON TEMPERATURE-VISCOSITY CHARACTERISTICS OF DISTILLATE OILS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 4, Apr 86 pp 16-17

[Article by B.V. Gryaznov, V.B. Krylov and T.V. Chernyayeva, All-Union Scientific Research Institute of Oil Refining]

[Abstract] A study was conducted on the effects of extensive purification of distillate oils with pour points of  $-55$  to  $-50^{\circ}\text{C}$  and viscosities of ca.  $5$  to  $8 \text{ mm}^2/\text{sec}$  at  $100^{\circ}\text{C}$  on the viscosity characteristics of such oils. The resultant data demonstrated that oils with a viscosity index of 90-93 or better, a viscosity of  $7-7.5 \text{ mm}^2/\text{sec}$ , and a pour point of  $-50^{\circ}\text{C}$  can be obtained by selective purification of oils with intermediate viscosities (ca.  $5 \text{ mm}^2/\text{sec}$  at  $100^{\circ}\text{C}$ ) using a phenol:distillate oil ratio of  $(4.5-5.5):1$ . The product has temperature-viscosity characteristics essentially equivalent to those of ASV-5 oil, but possesses the advantage of a lower pour point (vs.  $-45^{\circ}\text{C}$  for ASV-5). However, the yield is 12-18% lower than that customarily obtained in refining ASV-5. References 2 (Russian).

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CSO: 1841/580

## PREPARATION OF MULTIFUNCTIONAL ADDITIVES FOR LUBRICATING OILS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 4, Apr 86 pp 17-18

[Article by N.G. Abdullayev, G.R. Gasan-zade, A.G. Rzayeva and A.A. Makhmudov, Institute of Chemical Additives, Azerbaijan SSR Academy of Sciences]

[Abstract] A method has been devised for the preparation of sulfonate additives to lubricating oils, which relies on sulfomethylation of alkylphenols with sodium hydroxymethane-sulfonate. After sulfomethylation at 60-80°C, the sulfoalkylated products were reacted with barium, calcium, strontium or magnesium hydroxide at 30-70°C for 5-6 h to produce the multifunctional additives. Testing of the additives showed them to possess high antioxidant, anticorrosion, antiwear, and detergent properties. Particularly outstanding was the barium sulfonate product (IKhP-301), which exceeded the conventional additive IKhP-101 in preventing corrosion and wear of metal parts, and additive SKDNF in its properties as a detergent and in improving viscosity of test oil M-11 in a concentration of 10%. References 8 (Russian).

12172/9716

CSO: 1841/580

UDC 662.75:665

## UPDATING FILTERS FOR JET FUEL PURIFICATION IN END-STAGE OF PRODUCTION

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 4, Apr 86 pp 20-22

[Article by V.G. Bobrovitskiy, A.I. Samokhvalov, Yu.A. Golubev and P.G. Neklesa, Moscow Refinery: "Vtornefteprodukt" All-Union Association]

[Abstract] In view of the strict requirements for jet fuel purity, a brief review is presented of some commonly used filter systems in the end-stage of production. Evaluation of a variety of conventional systems has shown that superior results in purification can be achieved with a filter constructed from BFM-P material that had been treated with phenol-formaldehyde resin. Used in a Regotmas 564K-1-06 system, the FOSN-400 M filter was effective in retention of 90% of 20-25  $\mu$ m particles, had a flow volume of 400 m<sup>3</sup>/h, and nominal and limit pressure drops of 30 and 150 kPa, respectively. The filters are generally washed and replaced after 50 to 60 thousand cubic meters of fuel had been filtered. However, even after that amount the filter resistance increases by only 40-60 kPa, indicating that even longer intervals for changing filters can be tolerated. Figures 2; references 5 (Russian).

12172/9716

CSO: 1841/580

## SPATIAL AND SURFACE CHARACTERISTICS OF COMBINED OIL-SOLUBLE CORROSION INHIBITORS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 4, Apr 86 pp 23-26

[Article by Yu.N. Skekhter, L.P. Mayko, N.N. Zakharova, Ye.S. Churshukov, G.B. Shirokova and N.M. Maryakhin]

[Abstract] An analysis was conducted on the different properties of corrosion-inhibiting surfactants to evaluate individual-type of inhibitors and combined NG-11ON inhibitor. Determinations of changes in dielectric constants and spectral parameters, as well as assessment of thermodynamic data derived from metal-surfactant interaction pointed to the advantages of NG-11ON. Corrosion inhibitor NG-11ON provided the highest absolute thermodynamic values. The energy of activation of NG-11ON (137 kJ/mole) was 2- to 3-fold higher than that of conventional additives Akor-1 (43.4 kJ/mole) or of SABCa (65.9 kJ/mole). The high negative value for the change in entropy for NG-11ON ( $-318 \text{ J}/(\text{mole} \cdot \text{K})$ ) (vs.  $-74.4$  and  $-76.8 \text{ J}/(\text{mole} \cdot \text{K})$  for Akor-1 and SABCa, respectively) indicates a high degree of ordering of the NG-11ON molecules on the metal surface, while the changes in enthalpy and the isobar-isothermic potential underscored the spontaneity of the exothermic process. As a result of the combination of several surfactant properties in one molecule a synergistic effect of spatial and surface properties was attained in the case of NG-11ON, rendering it an outstanding corrosion inhibitor. Figures 3; references 12: 11 Russian, 1 Western.

12172/9716  
CSO: 1841/580

UDC 621.892.097+541.183.5

## EFFECTS OF STRENGTH OF ACID CENTERS OF ADSORBENTS ON OIL DECOLORIZING EFFICIENCY

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 4, Apr 86 pp 36-38

[Article by Sh.B. Battalova and A.A. Likeroval, Institute of Chemical Sciences, Kazakh SSR Academy of Sciences]

[Abstract] Several fuller's earth products were tested for their efficiency in decolorizing oil before and after activation with 10% sulfuric acid. Of the products tested for the energy of activation for desorption of ammonia, exchange acidity ( $\text{H}^+ + \text{Al}^{3+}$ ), specific surface area, pore volume, pore radius, and decolorizing efficiency with respect to aviation and white oil, M-14 montmorillonite was found to exceed the other samples (vermiculite B550-10, and synthetic aluminum silicates ShAS-2 and Mg-Si). M-14 possessed the optimal strength of the acid centers for oil treatment without gumming, and also promoted removal of heavy and intermediate aromatic compounds, all of the nitrogenous compounds, and a significant portion of sulfur compounds. Figures 2; references 9: 8 Russian, 1 Western.

12172/9716  
CSO: 1841/580

## CROWN ETHER AS EFFECTIVE CORROSION INHIBITORS IN ENGINE OILS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 4, Apr 86 pp 42-43

[Article by A.I. Panidi, A.A. Gureyev, V.L. Lashkhi and A.V. Kozhekin, Moscow Order of the Red Banner of Labor Institute of Petrochemical Gas Industry imeni I.M. Gubkin]

[Abstract] Five crown ethers were tested for their effectiveness as corrosion inhibitors in engine oils, using lead and copper strips as the exposure targets at 180°C. The most effective agent was identified as a crown-3 ether used in a concentration of 0.2-0.5%. Crown-3 was also effective in preserving the kinematic viscosity of the oil (9 mm<sup>2</sup>/sec), indicating its efficiency as an antioxidant. Figures 1; references 4: 1 Russian, 3 Western.

12172/9716

CSO: 1841/580

UDC 665.765-401.038.2

## PROXANOL-186 AS ANTIFRICTION AND ANTIWEAR ADDITIVE IN TRANSFORMER OIL

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 4, Apr 86 pp 43-44

[Article by A.A. Kalinin, Ivanovo Institute of Chemical Technology]

[Abstract] Proxanol-186, a block copolymer of ethylene oxide and propylene, has undergone testing for its efficacy as an antiwear and antifriction additive in transformer oil on porous bronzegraphite BGr-4 and steel 45 (HV-550). Trials with proxanol-186 concentrations of 1-5% showed a linear, concentration related, improvement in wear and reduction in friction. The effectiveness of proxanol-186 was further improved by the addition of an equal volume of an ethanol-glycerol mixture. These observations indicate that proxanol in combination with ethanol-glycerol mixtures may be used in preparing novel lubricating oils. Figures 2; references 3 (Russian).

12172/9716

CSO: 1841/580

## PHARMACOLOGY AND TOXICOLOGY

### LABORATORY DEVELOPING PLANT PROTECTION RESOURCES

Dushanbe KOMMUNIST TADZHIKISTANA in Russian 26 Apr 86 p 3

[Interview with laboratory director I. M. Nasyrov; date and place not specified: "From the Laboratory to the Field"]

[Text] The Laboratory of the Chemistry of Synthetic Biologically Active Substances of the Chemistry Institute imeni V. I. Nikitin of the republic's Academy of Sciences was created 5 years ago out of a small scientific subdivision. Today this laboratory, the institute's largest, is carrying on major fundamental and applied research having important national economic significance. Our correspondent asked laboratory director I. M. Nasyrov to answer a number of questions.

[Question] Please describe your laboratory, Inom Mansurovich.

[Answer] The laboratory's present short range and long range goals and tasks are in its name. We are working in the area of organic synthesis, and more specifically on directed creation of new, highly effective substances for the needs of medicine and agriculture. Let me explain the use of the word "directed." Until recently, and even today in a number of cases, chemists have been synthesizing biologically active substances either on the basis of the people's experience or on analogy, by the so-called trial and error method. It has been estimated that when research is organized in this way, 30,000-40,000 compounds must be synthesized to arrive at one new medicinal preparation. This takes 12-15 years. And the path of the preparation from the laboratory flask to the pharmacy shelf costs tens of millions of rubles.

About the same picture is observed with the creation of a new chemical plant protection resource. We in the laboratory were among the first in the country to use a mathematical method to build substances. Constant dialogue with a computer allows us to reveal the most optimum structure, one possessing a particular form of predicted activity. Then technicians specializing in experimental synthesis take over. By the way, we can also boast that we are one of the first chemical laboratories in the country to have our own computer complex.

[Question] What have been the results?

[Answer] It is still too early to talk about the end results. But a number of compounds obtained in this fashion are already undergoing testing today. These include antiviral substances, substances which provide protection against radiation, minor tranquilizers, blood anticoagulants and inhibitors of the most diverse microorganisms. Let me cite this one figure: During the last five-year plan we issued over 30 author's certificates for new biologically active substances.

I am sure that new, more significant successes await us in the years ahead. The fact is that the laboratory has begun research on directed acquisition of active substances through the study of the mechanism of action of preparations in living organisms, and through analysis of their decomposition products. Thus we were able to establish that a number of the compounds we obtained that normally do not exhibit any activity unexpectedly display high activity when they enter a plant organism for example. It was found that this action is associated with certain decomposition products of these compounds. This opens up wide prospects for creating practically atoxic preparations that are safe to man and the environment.

[Question] Are you also conducting practical research?

[Answer] On recommendation of the USSR Academy of Sciences, 2 years ago our laboratory was appointed one of the executors in a program to implement a most important assignment from directive organs concerned with providing the country's agriculture with the latest and most effective plant protection resources within the shortest time possible.

Today we can state with satisfaction that the procedures for using one preparation--an insecticide with a broad spectrum of action--were developed jointly with the Chemistry Institute of the Bashkir Affiliate of the USSR Academy of Sciences. Experimental lots were produced. New compounds based on this ingredient were created in our laboratory, and tests will begin on the compound in the next few days. We are working on another preparation with defoliant action jointly with the Chemistry Institute of the Ural Scientific Center of the USSR Academy of Sciences. By the end of the year the first experimental samples obtained by the new procedure will be given to specialists for field tests.

[Question] Where are new production procedures tested out?

[Answer] The first preparation was obtained by an experimental production operation at the Ufa institute, and the procedures for making the second will be tested in one of the sector scientific research institutes in Moscow. I think that after 2 or 3 years we will be able to conduct similar work in our own experimental production operations.

We have been provided with significant assets for the planning and construction of an experimental production operation. If the planners keep their promise and issue the plans this year, construction should begin by as early as 1987.



[Question] Inom Mansurovich, we know that chemical plant protection resources still do a certain amount of harm to the environment. How do you envision the further development of your research from this aspect?

[Answer] Farming cannot do without pesticides today. Naturally, research on improving chemical protection resources will continue intensively and on a wide scale. But looking toward tomorrow, chemical scientists have already begun creating preparations similar to natural substances. I am referring to substances that are released by living organisms for communication purposes.

For example, everyone is aware of pheromones. Three years ago we started creating these classes of compounds. We have already developed the methods for synthesizing experimental lots of new substances having the action of pheromones, chemical sterilizers and repellents (preparations with repelling action), and experimental lots of these substances have been obtained. The significance of such resources to agriculture is difficult to overstate. But in general our main dream is to use the principles of bionics in organic chemistry to consciously control biological processes by means of the same resources used by nature, rather than employing synthetic substances alien to it. This direction in science may be called ecological chemistry.

[Question] Are the interests of your laboratory limited to creating biologically active substances? Are you not interested in chemical substances for other sectors of the national economy?

[Answer] We have been and continue to be interested in so-called "technically" active substances as well. We have achieved directed synthesis of a significant quantity of flotation reagents and sorbents for concentration processes, stabilizers and dyes for textile materials, additives to oils and fuels that improve their quality, and so on, and we have tested them out. Unfortunately the absence of an experimental base is hindering their introduction into the national economy.

[Question] In a word, it seems that the laboratory understands and is keeping a close watch on the urgent problems of the most different facets of the development and improvement of low-volume chemical production in the country?

[Answer] More than that: To the extent that our powers and possibilities allow, we are trying to make our own contribution to solving these problems. In this connection I would like to recall something M. S. Gorbachev said.

"The boom of low-volume chemistry, of the production of pure and ultrapure materials which are determining the level of modern technology in many ways, is growing throughout the world. This is why we need to double and triple our efforts so as not to fall behind," he said. After all, low-volume chemistry is responsible for the production of, besides other things, chemical reagents. If accelerating introduction of the accomplishments of science and production is a topic of discussion today, then we must not forget that the most important step in this process is to significantly expand the assortment of chemical reagents as soon as possible. Life demands

fundamental reexamination of our relationship to this problem. An all-union specific-purpose scientific-technical program pertaining to this issue has been created in our country, and it is being treated as one of the most important programs.

Our laboratory counts itself among the first that made its mark in this urgent problem, and which is continuing to work on it. Just in 1984-1985 the laboratory created over a hundred original chemical reagents for scientific research and submitted them to clients. The economic impact from their introduction was 210,000 rubles in 1984, and according to tentative data it was 500,000-600,000 rubles in 1985.

Twice our work was exhibited at the Exhibition of the Achievements of the USSR National Economy and marked by exhibition medals and diplomas. It is also pleasant to note that some other laboratories of the institute and the chemical departments of the state university and the Leninabad and Dushanbe soil science institutes are now working with us in our research aimed at developing new chemical reagents. Within a short time these joint efforts made it possible to expand the catalogue of reagents by more than 400 items.

11004

CSO: 1841/588

## PENICILLIN PRODUCTION AUTOMATED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 21 Jun 86 p 1

[Article by A. Gabunova, Saransk: "Automated Control Systems Are Controlling"]

[Text] The collective of the Saransk Medical Preparations Plant is actively renewing production. An automated system for controlling penicillin production processes was introduced here recently. Four fermenters with a capacity of 63 cubic meters each are operating at the enterprise in automated mode today. The biological cycle is controlled by microprocessors in accordance with a rigidly set program.

Introduction of the automated production process control system makes it possible to double the yield of the preparation from the same space while significantly improving product quality. Assimilation of the innovation will greatly reduce the number of service personnel required.

11004

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UDC 547.314:615.779.2:633.88

BIOACTIVE COMPOUNDS FROM CENTAUREA PSEUDOMACULOSA

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA in Russian No 3, May-Jun 86 (manuscript received 17 Apr 85) pp 65-69

[Article by S.M. Adekenov, G.M. Kadirberlina, V.I. Sadykova, T.I. Kupriyanova and A.D. Kagarlitskiy, Institute of Organic Synthesis and Carbon Chemistry, Kazakh SSR Academy of Sciences, Karaganda]

[Abstract] Chloroform extracts of the aerial parts of *Centaurea pseudomaculosa* were shown to possess antimicrobial activity, completely inhibiting the growth of *Staphylococcus aureus* 505 and *S. albus* 015, in a concentration of 100 µg/ml. A five-fold higher concentration of the extract was necessary for the complete inhibition of *Bacillus anthracoides* 96 and *Escherichia coli* 1267. Column chromatography was employed in analyses of the extracts, with the identification of beta-sitosterol, taraxasterol, 5-oxy-6,7,3<sup>l</sup>,4<sup>l</sup>-tetramethoxyflavone, and the sesquiterpene lactone cnicin. Cnicin was active in inhibiting mycelial growth of *Botrytis cinerea* by 77% and of *Fusarium moniliforme* by 72%. References 8: 2 Russian, 6 Western.

12172/9716  
CSO: 1841/579

UDC 678.5.01:677.862.552

EFFECTS OF TROPICAL CLIMATE ON VISCOELASTIC PROPERTIES OF STRUCTURAL POLYMERS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 86 pp 13-15

[Article by E.S. Umanskiy, N.S. Shidlovskiy, L.L. Stezhko, R.M. Kasyan, V.S. Sychev, B.N. Rybakov and B.P. Vorobyev]

[Abstract] Tests were made of the effects of a marine tropical climate on standard structural polymers and a copolymer. The data were analyzed in terms of changes in the dynamic modulus of elasticity and in the viscosity after periods of exposure ranging up to 12 months. Graphical and tabular data demonstrate that Silkon [sic] polycarbonate and low-density polyethylene were most adversely affected. The effects were less pronounced in the case of polypropylene, styrene-alpha-methylstyrene copolymer, polycarbonate, and PA-68 polyamide. The viscoelastic properties of high-density polyethylene and PA-12B polyamide were virtually unaffected. Figures 2; references 9: 8 Russian, 1 Western.

12172/9716

CSO: 1841/584

UDC 678.01:620.163.4

PHYSICAL AND MECHANICAL PROPERTIES OF POLYARYLATEARYLENESULFONOXIDE-POLYCARBONATE MIXTURES

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 86 pp 18-19

[Article by G.V. Kozlov, M.A. Gazayev, V.N. Shogenov and A.K. Mikitayev]

[Abstract] An evaluation was conducted on the impact resistance, heat stability and fabricability of mixtures of polyarylatearylenesulfonoxide (I) with polycarbonate (PC), to assess such mixtures as potential structural materials. Minimal values for the critical rate of release of energy of deformation ( $G_{ic}$ ) and the parameter of plastic work ( $I_c$ ) were determined for mixtures with 10% PC. With an increase in PC to 30% or better,  $G_{ic}$  decreased more than 2-fold while  $I_c$  increases to 138 kJ/m<sup>2</sup> and approached an asymptotic limit. Determinations of glassy transition temperatures ( $T_g$ ) for

different mixtures of I and PC showed that mixtures with up to 33% PC had virtually the same  $T_g$  as pure I (523 K). A further increase in the PC content led to a linear fall in  $T_g$ . Addition of PC to I improved fabricability of PC. At 565 K the fluidity increased from 0.35 g/10 min for pure I to ca. 1.5 g/10 min for mixtures with 70% PC. The temperature, at which fluidity is equal to 0.9 g/10 min, drops from 590 K for pure I to 530 K for the 70% PC mixture. Mixtures of I with PC were demonstrated to evidence properties that render them suitable as structural materials, possessing superior fabricability to I and higher thermal stability than PC. Figures 2; references 5: 4 Russian, 1 Western.

12172/9716

CSO: 1841/584

UDC 678.644'143.29+678.743.22.01

#### PROPERTIES OF PENTAPLAST+PVC COMPOSITIONS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 86 pp 19-21

[Article by A.I. Ilyasova, N.M. Ishmuratova, M.I. Somova, N.A. Somov, Yu.A. Mulin, V.S. Yuminov, G.A. Tolstikov and Yu.A. Sangalov]

[Abstract] Search for new composites led to studies on the physical and mechanical properties of pentaplast (PP) + PVC mixtures, with the selection of PVC based on the similarity of some of its characteristics to those of PP. Tabulated and graphic summaries are provided for the glass transition temperatures, flow points, fluidity data and thermograms for PP:PVC compositions ranging from 90:10 to 10:90 at 10% increments, and for pure PP and PVC. The detection of two glass transition temperatures for compositions with 30-40% PVC pointed to incompatibility of such mixtures, a problem which was not encountered with the other compositions. Changes in the fluidity index on heating at 200°C for 1 h showed that the compositions were essentially identical to PP in terms of heat stability, apparently due to PVC-induced structure formation. In addition, the impact resistance of PP and the compositions was also essentially identical. A temperature of ca. 250°C was required for decomposition of the PP+PVC compositions. The compositions were also refractory to the effects of sea water, acids, and aliphatic hydrocarbons. In general, the data showed that such compositions can be used in place of PP alone in a number of applications. Figures 1; references 9: 3 Polish, 6 Russian.

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## MOLECULAR MOBILITY AND MECHANICAL CHARACTERISTICS OF FLUORINATED COPOLYMERS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 86 pp 22-23

[Article by L.I. Truskova, B.I. Sazhin, L.A. Kvacheva, N.N. Peschanskaya and N.I. Astakhova]

[Abstract] To test the suitability of various fluorinated copolymers for the production of membranes and sealing strips, an assessment was conducted on the viscoelastic properties of selected copolymers, since such properties reflect molecular mobility and relaxation parameters. The determinations of yield points, mechanical characteristics, and the dynamic modulus of elasticity were performed on copolymers involving hexafluoropropylene and tetrafluoroethylene (designated SPL-I), and hexafluoropropylene and vinylidene fluoride (SPL-II). Data on the dynamic modulus of elasticity demonstrated that introduction of hexafluoropropylene markedly reduced the rigidity of the polymer chains and increased their mobility. However, comparison of SPL-I and SPL-II showed that within the working temperature range of  $-40$  to  $+100^{\circ}\text{C}$  SPL-I possessed superior properties for the uses intended. SPL-I evidenced a lower degree of mechanical deterioration on exposure to dynamic stresses, had a higher relaxation modulus, and a higher yield point. SPL-II was ascertained to be useful in the production of elastic membranes exposed to temperatures of  $-20$  to  $+20^{\circ}\text{C}$ . Figures 3; references 10 (Russian).

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## POLYMERIC COMPOSITIONS WITH HIGH DIELECTRIC CONSTANTS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 86 pp 27-28

[Article by V.D. Rumyantsev, V.B. Saltanova, V.D. Bolikhova, A.V. Stafeyev, Ye.S. Malashchenko and A.B. Sazhina]

[Abstract] In order to improve the dielectric constants of polymers, studies were conducted on an ethylene-vinyl acetate copolymer (ca. 20% vinyl acetate groups; V-108, GDR) filled with aluminum, nickel, or ferromagnetic ceramic powder, to determine the effects of such additives on dielectric properties of the copolymer. Graphical presentations of the effects of metallic or ceramic fillers on the dielectric constant at 3 GHz showed a sharp increase in dielectric permittivity with an increase in the content of nickel, reaching infinity with a nickel content of ca. 0.28 v/v. Concomitantly, a marked increase was also evident in dielectric losses expressed as  $\text{tg}\delta$ . Aluminum induced a more gradual increase in the dielectric constant, attributable to a dielectric oxide film on the surface of the aluminum particles which isolated the particles from one another and resulted in their polarization. The ferromagnetic ceramic material behaved in a manner analogous to aluminum with virtually identical plots. The compositions with aluminum have

significantly lower  $\tan \delta$  than the compositions with the ceramic material. The data demonstrated that the dielectric constants of the copolymer could be manipulated by the use of appropriate metallic fillers. Brittleness was effectively prevented by the incorporation of 1% aminopropyltriethoxysilane, without affecting the dielectric properties. Figures 2; references 7: 6 Russian, 1 Western.

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#### CORROSIVE CHARACTERISTICS OF SELF-QUENCHING RADIATION-MODIFIED POLYETHYLENE-AROMATIC BROMINE FIRE RETARDANT COMPOSITIONS

Moscow PLASTICHESKIYE MASSY in Russian No 5, May 86 pp 42-43

[Article by I.F. Gvozdukevich, L.F. Nesterenko, V.A. Sirotkina and D.G. Besarab]

[Abstract] An analysis was conducted on the factors responsible for the corrosive properties of self-quenching radiation-modified compositions prepared from high-density polyethylene (PE) and either 12% hexabromobenzene or 12% decabromodiphenyloxide, with 5% antimony trioxide. Exposure of copper strips to the PE-fire retardant compositions for 5 h at high temperatures (to 200°C) showed that the concentration of free bromine in the aromatic bromine compounds was a key factor in determining corrosiveness of the compositions. At elevated temperatures the free bromine reacted with hydrogen atoms of the PE component, leading to the formation of HBr. The latter reacted with the oxide film on the copper, resulting in corrosive damage and the formation of CuBr and CuBr<sub>2</sub>. Obvious means of minimizing corrosion must involve steps to eliminate free bromine from the fire retardants, the addition of agents that would bind free bromine, or the use of additives that would coat the copper surface and prevent reaction of HBr with the copper oxides. Figures 2; references 2 (Russian).

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#### ADHESIVENESS OF ETHYLENE-VINYL ACETATE COPOLYMERS

Moscow PLASTICHESKIYE MASSY in Russian No 7, Jul 86 pp 7-8

[Article by F.I. Duntov, V.D. Rumyantsev, A.N. Karasev, A.L. Goldenberg, V.M. Belyayev, L.V. Mashkova, G.P. Gradoboyeva, T.A. Fadeyeva, Ye.A. Vasilenko, M.N. Shustitskaya and L.K. Sotnikova]

[Abstract] Various samples of ethylene-vinyl acetate adhesives (EVAA) were tested for adhesiveness, in order to relate bonding strength to EVAA processing



Methods. The adhesive layer of EVAA was formed over a metal surface at 200°C for 30 min under a pressure of 0.5 MPa, or at 130°C for 30 min and a pressure of 0.3 MPa. Analysis of the IR spectra of the various copolymers (Sevilen 11306-075, Miraviten V-108, Miraviten D23EA) and the effects of petroleum ether extractions demonstrated that the low bonding strength of Sevilen was due to the presence of synthetic lubricating oil Orites 210DS in the copolymer. These observations indicate that the bonding strength of EVAA-type adhesives is predicated not only by their structural characteristics and compositions, but also by the synthetic process that may introduce lubricating oils. Figures 1; references 4 (Russian).

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#### STRUCTURE FORMATION IN LOW-DENSITY POLYETHYLENE BY ORGANOSILANE COMPOUNDS

Moscow PLASTICHESKIYE MASSY in Russian No 7, Jul 86 pp 23-34

[Article by T.P. Khvatova, A.S. Glebko, V.D. Bolikhova, V.B. Saltanova, Ye.I. Yevdokimov, E.S. Borodin and R.A. Lashchiver]

[Abstract] An analysis was conducted on the principles underlying cross-linked polyethylene (XLPE) formation from low-density PE (LDPE), using vinyltriethoxysilane as the cross-linking agent and organic peroxides. The physical measurements demonstrated that during cross-linking at 180-200°C under the defined conditions the flow index is markedly decreased. The reduction in the flow index in combination with the presence of a gel fraction in the XLPE is indicative of premature structure formation in the polymer. As the temperature of extrusion is increased the flow index increases, while the gel component decreases. Commercial 277-73 HDPE gave superior XLPE samples characterized by high yield points, extensive cross-linking, and virtual absence of premature structure formation. Analysis of  $\bar{M}_w$  and  $\bar{M}_n$  values demonstrated that vinyltriethoxysilane leads to high MW XLPE. Introduction of biphenols into the system reduces the MW parameter, while having a negligible effect on cross-linking. Figures 1; references 3 (Russian).

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## EVALUATION OF ADHESIVE WORKING LIFE IN INTERMEDIATE PRODUCTS--PREPREGS

Moscow PLASTICHESKIYE MASSY in Russian No 7, Jul 86 pp 24-26

[Article by Yu.N. Smirnov, T.Ye. Shatskaya, V.I. Natrusov and V.A. Lapitskiy]

[Abstract] Consideration is given to the factors affecting the working life of epoxy resins used as adhesives in intermediate composites, prepregs [N.B. Prepregs are described by the authors as "preliminarily impregnated reinforcing materials"] as a parameter that affects the technological utility of such products. Two interdependent processes occur on storage, the first of which consists of gelation. Gelation represents chemical structure formation as a result of the establishment of a network of chemical bonds, leading to the use of gelation time (GT) for assessing working life of a composite. In practice, the working life is generally much shorter than that indicated by GT due to the onset of the second limiting process, that of physical structuring (i.e., formation of a network of physical bonds). The latter is labile in nature and can be attenuated by elevated temperatures, addition of plasticizers, as well as other methods. A convenient method for the rapid estimation of working life is provided by the relationship  $GT = A \cdot e^{-E_a/RT}$ , i.e., the Arrhenius equation, which allows for the determination of GT at 20°C by linear extrapolation from a higher temperature. Components can be selected to give a high  $E_a$  (energy of activation), insuring a long working life of the intermediate products at room temperature. References 7: 1 Polish, 6 Russian.

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## MECHANISM OF SWELLING OF ION-EXCHANGE MEMBRANES IN ORGANIC SOLVENTS

Moscow PLASTICHESKIYE MASSY in Russian No 7, Jul 86 pp 26-27

[Article by K.M. Saldadze, D.I. Karaulashvili and Ts.S. Kurtskhaliya]

[Abstract] An evaluation was conducted on the swelling mechanism in the case of membranes MA-40 ( $Cl^-$  form) and MK-40 ( $H^+$  form) in cyclohexanone at 20 and 50°C, to assess their suitability in electrodialysis. After 40 h of exposure to cyclohexanone the degree of swelling of both membranes at both temperatures was equivalent to 102%, accompanied by a loss in membrane weight. Weight loss was attributed to the ease of permeation of the membranes by the cyclohexanone molecules, and the fact that one molecule of the organic solvent displaced a much larger number of water molecules from the membranes due to the differences in their respective molecular radii. The increase in membrane volume with a concomitant weight reduction resulted in an increase in membrane density. The absence of a temperature effect was due to the fact that temperature affects only the solvating properties of the counterions. Maximum swelling of the membranes corresponds to maximum electrical resistance which, in turn, has an effect on the efficiency of electrodialysis. Figures 2; references 4 (Russian).

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## METHOD FOR TESTING PLASTICS FOR LIGHT STABILITY

Moscow PLASTICHESKIYE MASSY in Russian No 7, Jul 86 p 40

[Article by N.M. Savvo, A.B. Kamenetskiy, R.G. Chebotkevich, M.S. Gubanova and G.N. Krasnova]

[Abstract] Brief description is provided for testing light sensitivity of plastics, consisting essentially of exposure to a controlled light source and subsequent determinations of hydrophobicity for comparison with the values for unexposed samples. For studies on the effects of UV light, the samples were encased in a quartz capsule filled with argon under a pressure of 0.133 Pa. Following exposure to light from DRT-220 and carbon-arc lamps, the wetting angle of the plastic samples changed by as much as 60%. The use of optimal doses of protective additives favored the retention of hydrophobicity.

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## SIMPLE METHODS FOR POLYMER IDENTIFICATION

Moscow PLASTICHESKIYE MASSY in Russian No 7, Jul 86 pp 40-42

[Article by T.A. Fadeyeva, V.M. Ryabikova, T.L. Ivanova and L.V. Toporkova]

[Abstract] Extensive and increasing use of various polymeric substances in all areas of human endeavor has made it necessary to devise a simple, yet reliable, method of polymer identification. Data tabulated for a variety of polymers have shown that, as a first approximation, a multitude of polymers can be identified on the basis of appearance, melting point, density, buoyance in water and sodium thiosulfate, flammability, pyrolysis and the odor accompanying combustion. Such methods are generally applicable to polymers and compositions with small concentrations of inorganic additives. However, such an approach cannot readily be applied to multicomponent polymeric composites or whenever high concentrations of organic or inorganic additives are present. References 6: 1 Serbian, 2 Russian, 3 Western.

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## METAL SULFIDE COATINGS

Moscow PLASTICHESKIYE MASSY in Russian No 7, Jul 86 p 63

[Article by I.I. Stavnitser]

[Abstract] A study was conducted on the process of applying metal coatings to polymeric materials, to define parameters ensuring optimal electrical and optical characteristics. The processes under analysis consisted of chemical precipitation of NiS, FeS or CoS on a polystyrene, polyethyleneterephthalate, or high-density polyethylene substrate, and sulfuration with Na<sub>2</sub>S. Increasing the concentration of NiSO<sub>4</sub> from 50 to 300 g/liter, for example, resulted in a reduction in the electrical resistance of the surface from  $5 \times 10^6$  to  $2 \times 10^4$  ohm.m. Similarly, such an adjustment in the concentration led to an increase in the optical density from 0.12 to 0.39. A reduction in Na<sub>2</sub>S from 100 to 5 g/liter improved the electrical conductivity 50-fold, and the optical density 2.3-fold. Intensive mixing during sulfuration favored the formation of small colloid sulfide particles which, in the case of NiS, increased electrical conductivity of the coating 100-fold and the optical density 3-fold. However, duration of adsorption was virtually without effect, while extension of sulfuration to 30 sec led to an increase in the size of the colloid particles and cessation of the coating process. Adhesion of the metal sulfide coatings was unrelated to the metal employed, but determined by the nature of the surface of the plastic substrate. References 4: 3 Russian, 1 Western.

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## MAJOR TRENDS IN STUDIES ON RECYCLED POLYMERS

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 86 pp 6-8

[Article by V.G. Protasov]

[Abstract] The increasing use of polymers in industry and in domestic situations has resulted in a vast quantity of waste products and byproducts that, to date, seem largely underutilized. Recycling such polymers in a rational and cost-effective manner requires an evaluation of their properties both as a starting material, as a secondary raw material, and in terms of changes induced during fabrication, use, and storage of exposure under a variety of climatic conditions. A general feature of any approach to the reutilization of this class of polymers is the selection of the most cost-effective technology to justify the effort involved in recovery and reprocessing. Only a theoretical analysis of all the parameters characterizing the reuse of such polymers can provide a final determination as to the usefulness of such materials in the national economy. References 8 (Russian).

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## IMPROVING EFFICIENCY IN UTILIZATION OF RECYCLED POLYMERIC MATERIALS

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 86 pp 8-10

[Article by V.Ye. Gul]

[Abstract] In the period 1960-1983 more than 20 million tons of various plastic materials were produced in the USSR, indicating that more serious consideration must be given to more rational utilization of recycled polymeric materials as a valuable national resource. Reinforced thermoplastics may find further use as an energy source when subjected to combustion, as a fuel when subjected to pyrolysis, or as a raw material for reprocessing into new materials or articles. Any further reprocessing requires determinations of changes that may have been induced in the polymers by use, exposure to physical and chemical factors, or simple aging. In addition, various methods may also be used to modify such materials to render them suitable for intended use. All of the physicochemical methods of modification involve changes in the chemical structure and formation of active free radicals. Most modifications involve reactions of the free radicals with the modifying chemical agents, and yield polymers with a more stable structure during processing and use. Such reactions are facilitated by physical treatment of the recycled polymeric materials that breaks them down into fine particles, and milling to increase the reactive surface. Current efforts are directed at simplifying the various mechanical and chemical steps in the processing of these materials, in order to enhance their cost-effectiveness as a raw material. References 17: 15 Russian, 2 Western.

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## IMPORTANCE OF POLYMER MIXES IN IMPROVING COST EFFECTIVENESS OF UTILIZATION OF RECYCLED RESOURCES

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 86 pp 11-13

[Article by V.N. Kuleznev and O.B. Ushakova]

[Abstract] The primary use for recycled polymeric materials lies in reprocessing into new articles, a practice which also has a significant impact on environmental protection. Polymeric recycled and waste products consist of 55-62% polyolefins, 18-28% styrene plastics, and 6-11% polyvinyl chloride. Complete separation of polymeric mixtures encounters technological difficulties and is often undesirable in the final analysis because of the poor mechanical characteristics of the resultant polymers. In view of this, composite polymeric materials represent the most attractive alternative for the utilization of recycled polymeric products. Consequently, technology that involves compounding has a prominent place in recycling polymers. Some of the more important and useful products obtained in this manner consist of polyolefin mixtures. These

are prepared by conjoint processing of recycled high-density polyethylene, recycled polypropylene, and recycled low-density polyethylene. The final product is generally equivalent to virgin high-density polyethylene (HDPE). Mixtures of primary polyethylenes and polystyrene (PS) do not yield high-quality products, while products derived from HDPE and recycled (PS) yield materials with greater rigidity than HDPE. The latter products, however, are more elastic than PS and retain the dielectric characteristics of PS. Many other cases may be presented that illustrate the advantages of polymeric mixtures in recycling polymers. References 8: 7 Russian, 1 Western.

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#### RHEOLOGIC PROPERTIES AND NOVEL PROCESSING TECHNOLOGY FOR RECYCLED POLYMERIC MATERIALS

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 86 pp 16-18

[Article by M.L. Fridman, A.Z. Petrosyan and G.A. Kazaryan]

[Abstract] Processing of recycled polymeric materials requires a detailed understanding of their rheological characteristics, particularly since their primary and best use comes from the creation of new composite materials. The recycled components differ from the virgin polymers in that they have sustained a variety of physical and chemical modifications in previous processing and in use and, as a result, contain many more reactive groups and components. All of these factors bear on their rheological characteristics and find manifestation in the extrusion, acoustic treatment, and solid-phase mixing processes commonly employed. For example, introduction of fillers into such thermoplastic materials generally increases their susceptibility to thermomechanical destruction and lowers their viscosity and viscoelasticity. However, the use of dispersed mineral fillers that enhance thermal stability of polymers has resulted in stabilization of the rheologic properties of recycled composite materials. References 18: 12 Russian, 6 Western.

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#### POLYMER AGING AND RECYCLING

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 86 pp 24-27

[Article by T.V. Kharechko and V.G. Protasov]

[Abstract] A detailed analysis of the aging process in polymers is an absolute prerequisite for recycling, as it provides a basis for evaluating structural and mechanical changes and suitability for further processing. Studies with

high-density polyethylene (HDPE) films aged under the climatic conditions of Kiev and Sukhumi, with exposure to either 254 or 300 nm light, showed deterioration in physicomachanical parameters of the samples. These were due to changes in solubility predicated on the appearance of gel fractions and low MW products, the accumulation of significant concentrations of C=O groups, alterations in the relationships of the various other chemical groups, less stability in the face of surfactants, radical-free photodecomposition of ketones, etc. The experimental data were analyzed to demonstrate that photoaging of HDPE involves two simultaneous processes: radical photooxidation and nonradical ketone decomposition. Since recycled HDPE products have significantly more ketone groups, the latter process is much more pronounced in such products. The concentration of ketone groups, then, may be used to assess light stability of recycled PE, since this parameter can be used to predict the working life of products made from recycled PE. If the concentration of the ketone groups in the recycled HDPE is equal to or less than 0.1 moles/kg the material can be used for producing articles that are going to be exposed to atmospheric conditions. If the concentration is greater than 0.1 moles/kg, such exposure for the products is contraindicated. Figures 4; references 6 (Russian).

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#### UTILIZATION OF FILLED RECYCLED POLYETHYLENE

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 86 pp 31-32

[Article by O.M. Peskova, Ye.I. Besspalov, V.V. Zagurskaya and Yu.V. Sporov]

[Abstract] An evaluation was conducted on the use of fillers for improving the working characteristics of recycled polyethylene (PE) products, using type B, V and A PE samples. The two and three-component systems were filled with TRPN talc, MMO chalk, and/or the dust recovered from purification of open hearth effluent gases. Adding the fillers to a concentration of 20-30% resulted in 1.5- to 3-fold improvements in such characteristics as the flow index, yield point, tensile strength, hardness, and pour density. Filled composition of this type had, therefore, some of the properties resembling those of high-density PE, rendering them a valuable resource and increasing their scope of applications. References 4 (Russian).

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PLASTICITY AND CAPACITY FOR FAILURE IN RECYCLED POLYETHYLENE

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 86 pp 32-33

[Article by V.L. Shreder, A.Ye. Chalykh, N.I. Mishin and V.N. Krivoshey]

[Abstract] Pressure molding was employed in an analysis of the plasticity and susceptibility to defects of high-density polyethylene (HDPE), recycled PE and HDPE-recycled PE compositions. The resultant data demonstrated that optimal characteristics were possessed by composite materials containing 25-30% recycled PE. Materials containing 5-20% recycled PE showed the highest degree of swelling and absorptive capacity. Composite materials with 5-15% recycled PE were characterized by depressed density, while those with 15-80% recycled PE had somewhat greater density. In addition, compositions with 5-15% recycled PE had the highest number of imperfections and other defects on molding. Nevertheless, the data indicate that, depending on final use of the products, a wide range of HDPE-recycled PE materials may find industrial applications. Figures 2; references 6: 4 Russian, 2 Western.

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SANITARY AND HYGIENIC EVALUATION OF REGENERATED RECYCLED POLYETHYLENE

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 86 pp 35-36

[Article by G.K. Kiriyenko, V.A. Satsyuk, L.S. Vinokurova, I.V. Kokarev and S.A. Shalatskaya]

[Abstract] A sanitary and hygienic evaluation was conducted on regenerated recycled polyethylene (PE), in order to determine potential scope of usefulness. Trials conducted with unmodified samples and samples filled with either 0.8% agidol-2 [sic] or 1.0% ionol + 1.0% MTsM bisalkophen [sic] showed marked differences between these two categories of recycled PE. The filled samples were less subject to oxidation and bromination in comparison with the unmodified PE, even after 6 months of storage. In both categories of samples, aging was accompanied by the accumulation of low MW compounds, including formaldehyde, which were extractable with water. However, the rate of formation of the low MW components was twice as great in the unmodified PE sample. It is evident that, in addition to altering the chemical and physical characteristics of recycled PE, the chemical additives have the additional benefit of rendering such polymers less toxic. Figures 2; references 2 (Russian).

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## FORMULATION OF HEAT-RESISTANT GLASS-REINFORCED PLASTICS USING POLYISOCYANATES

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 86 pp 49-50

[Article by V.A. Pershin, L.P. Tereshchenko and V.I. Dreytser]

[Abstract] The usefulness of glass-reinforced epoxy plastics is limited because of rapid deterioration on exposure to high temperatures. Consequently, composites were prepared using polyisocyanates and tested for their tolerance of high temperatures to determine whether polyisocyanates would increase heat stability, as they have been shown to do in other compositions. The introduction of polyisocyanates into glass-reinforced epoxy plastics was shown to markedly increase heat stability with retention of 65-80% of the initial strength characteristics after exposure to 503 K for 210 h. At 523 K deterioration was more marked; however, for samples with an orthogonally reinforced structure 35-50% of the initial strength was retained. These findings indicate that polyisocyanates may be used as additives in glass-reinforced epoxy plastics to expand their scope of application at high temperatures. Figures 1; references 4: 1 Russian, 3 Western.

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## PROPERTIES OF COMPOSITIONS FORMED FROM POLYMERIZATION-FILLED POLYPROPYLENE

Moscow PLASTICHESKIYE MASSY in Russian No 6, Jun 86 pp 50-52

[Article by T.V. Maksimova, I.O. Stalnova, O.I. Kudinova, I.M. Agadzhanian and T.A. Ladygina]

[Abstract] Various studies were conducted on the tensile strength, frost resistance, viscosity, impact resistance, etc. on compositions formed from polymerization-loaded polypropylene (PE). The mineral fillers used in the various compositions were tuff, kaolin, or calcite. Evaluation of the various preparations (polymerization-filled PE, and polymerization-filled PE + commercial PE and commercial PE + unmodified fillers) demonstrated that polymerization-loaded PE imparted increased frost resistance and elasticity. These differences were ascribed to the polymeric component grafted to the filler surface and their increased flexibility, in distinction to the relative inflexibility on simple mechanical mixing of unmodified fillers with PE. Tuff yielded compositions that were frost and impact resistance and highly suitable for molding and extrusion processes, while kaolin and calcite provided materials with enhanced deformability at room temperature. Polymers with 30-50% filler can be processed directly, while those with 60-90% filler may be used as modified filler for 'dilution' with commercially available polymers. Figures 2; references 7 (Russian).

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## EFFECT OF INTERMEDIATE PRODUCT (AMINOESTER) ON FORMATION OF INITIATING RADICALS IN PEROXIDE-TERTIARY AMINE SYSTEM

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA in Russian Vol 29, No 5, May 86 (manuscript received 19 Nov 84) pp 107-109

[Article by Ye.P. Yefremova, S.D. Stavrova, K.I. Rogozin and A.N. Prabednikov, Department of Polymer Synthesis, Moscow Institute of Fine Chemical Technology im. M.V. Lomonosov]

[Abstract] A two step method was developed for preparing N-phenyl-N-methylaminomethylbenzoate (I), which is an analog of an aminoester, an intermediate product of the reaction of benzoyl peroxide and dimethylaniline. Chloromethylbenzoate (II) (step 1) was prepared at 80°C from benzoylchloride, paraformaldehyde and  $ZnCl_2$ . Yield of (II) ( $C_8H_7O_2Cl$ ) was 73%, b. pt. 116°C at 1.32 kPa; found (calc.), %: 56.98 (55.98) C, 21.01 (20.60) Cl, 4.09 (4.08) H. Step 2, (I), was synthesized from 102.2g (II) and 127.7g monomethylaniline at room temperature in dry benzene for 3 hrs. Yield of (I) ( $C_{15}H_{15}NO_2$ ) was 19.85g (8.6 N), m. pt. 44-46°C; found (calc), %: 74.72 (74.68) C, 6.30 (6.22) H, 5.87 (5.80) N. Structure of (I) was confirmed also by paramagnetic resonance. Infrared spectra showed dissociation of benzoyl peroxide with dimethylaniline and the aminoester at room temperature as a function of time. Benzoyl peroxide and (I) initiate styrene polymerization but less effectively than the system benzoyl peroxide and dimethylaniline. This correlates with data for the dissociation of benzoyl peroxide with (I) and dimethylaniline. It was demonstrated that intermediate compounds of the aminoester type can be formed during the reaction of peroxides with tertiary amines and they have an activating effect on the dissociation of the peroxide. Figures 2; references 5: 4 Russian, 1 Western.

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## WOOD CHEMISTRY

### CHANGES SUGGESTED IN FAR EASTERN LUMBER INDUSTRY

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 6 Aug 86 p 2

[Article by Doctor of Agricultural Sciences A. Sheyngauz, director, Laboratory of Forestry Economics and Organization, Far Eastern Scientific Research Institute of Forestry, Khabarovsk: "The Timber Resources of the Far East"]

[Text] This is not the first year that the Far East's lumber industry has been unable to meet the plans. Depletion of resources is often cited as one of the main reasons for this. Could it really be that the reserves of raw material in such a forest-rich region as this are so exhausted? Scientific data do not confirm this conclusion. The lumber sector possesses real reserves. However, in order to put them in action, the industry must fundamentally change its orientation and adopt a course toward integrated utilization of natural resources and intensive processing of raw timber. This was the task posed to workers of the Far East and to the USSR Minlesbumprom [Ministry of Timber, Pulp and Paper, and Wood Processing Industry] in a speech given by CPSU Central Committee General Secretary M. S. Gorbachev in Vladivostok.

Let us begin with a few figures. Today less than half of the region's calculated felling area is being logged today. The reserve of mature and over-mature forests in the country's East total 6.9 billion cubic meters. According to an inventory, the territory occupied by forests widened from 117 to 119 billion hectares in the last 12 years--and this was during the time of most intensive development of the taiga. But let us not try to simplify the situation. Despite all of this, a problem still exists. It basically entails change in timber resources. The most productive timber stands have been exhausted. This is associated with the fact that Far Eastern lumber industry has traditionally followed the practice of "picking the plums." That is, felling the best and largest trees. To this day, according to our estimates from 17 to 65 percent of the lumber that could be taken is left behind in the logging parcels. Almost a fifth of this volume is millable.

That this is occurring is no accident.

In the 1950s and 1960s, when the power of logging trucks and rolling stock was increased, a transition to transport of trimmed logs was felt to be a major accomplishment. A trimmed log is the best part of a trunk, and it is delivered whole from the logging site to a lower storage site. This noticeably raised the labor productivity of both carrying the timber out and trimming it. But why are tree stumps 1 to 3 meters tall, the hardest part of the tree, left in the logging area? Why do they cut off and discard tops 7-10 meters long? The explanation here is purely arithmetic: The mean height of a trunk in Far Eastern forests is 20-25 meters. And many even taller are encountered. Also, the length of a millable trimmed log (it depends in particular on the overall dimensions of the transportation resources) is only 12-18 meters. Thus highly productive procedures have resulted in major losses, which are still occurring today.

It would seem that the simplest thing to do would be to fell and remove everything from a logging area which would be permissible according to forestry management conditions. But all of this is not as simple as may appear from first glance.

As was mentioned earlier, only a fifth of the wood is millable. The rest goes for firewood.

The district forestry administrations and integrated logging-lumber enterprises sell it to the public for 5-6 rubles a cubic meter. But the procurement cost is determined in relation to timber in general. That is, identically for both millable timber and firewood. As a result the lumber enterprises in central Khabarovskiy Kray, for example, get 10 rubles profit from every cubic meter of millable timber they procure, and suffer a 10-15 ruble loss for every cubic meter of firewood. That is the explanation for the paradoxical situation where the logging-lumber enterprise pays a fine for leaving firewood trees in the logging areas while people in taiga settlements sit without firewood.

The union State Committee for Prices, Gosplan and the Minlesbumprom doubtlessly need to reexamine the way prices are set, the estimated cost and, finally, the planning of the assortment of procured timber. And the problem has to do with more than just the cost of different types of products. Despite the great yield of firewood (in many timber stands it attains a fourth and sometimes even a third), the union Gosplan and Minlesbumprom continue to plan the yield of millable timber at 90-95 percent. In other words the assortment plan born in the offices is totally inconsistent with what is found in the forest. Let me say quite frankly that these methods of administration are precisely what compel the procurer to take only the best and leave the worst trees. Specialists aptly christened this as negative selection. Executives of Dallesprom turned to the USSR Minlesbumprom on several occasions with a request to make the assortment plan consistent with the structure of the felling areas. Commissions visited, and they studied the situation locally. But the planning has not changed.

The Carpathian logging region is usually referred to as an example of a sensible attitude toward forests. However, the experience of this and other

thriving regions is based to a great extent on good availability of labor resources. But in the Far East there is an acute shortage of working hands. Consequently reconstruction of our forestry complex must be oriented on maximum mechanization and automation of all processes. Concurrently we need to consider the lessons of previous years, when more-productive but heavier machines entered the forests. They do harm to both the soil and young trees. In the final analysis the amount of money that must be spent to correct the consequences is much greater than the payoff which we enjoy today. The USSR Minlesbumprom and its main institute, the Central Scientific Research Institute of Mechanization and Power Engineering in Lumber Industry, should coordinate with the USSR State Committee for Forestry and develop and introduce new, ecologically better machines and introduce them to logging.

Forestry also owes a great deal to the Far Eastern taiga. Today's silviculturalist cannot keep up with the logger, despite the fact that the rate of growth of forestry was greater than that of lumber industry in the postwar period. What is unfortunate is that this growth began almost from nothing. That is why many breaches in our timber resources remain unplugged.

Besides having to think about protecting and restoring the forests, the forestry administrations engage in considerable procurement--around 2 billion cubic meters per year. They are supposed to get this wood through their timber stand improvement operations. That is, by procuring rotting, curved and hollow logs from which only small articles like boards for packing crates can be manufactured. And yet the RSFSR Ministry of Forestry writes plans requiring them to produce long-length lumber, house framing and construction lumber and even milled lumber for export. It would be clear even to a non-specialist that such products cannot be gotten from damaged timber. Given such planning, the silviculturalist will deliberately select a healthy tree over a sick one. This is especially immoral because the areas in which the forestry administrations do their felling are special: They are under the surveillance of the forestry administrations themselves. It is with bitter irony that silviculturalists now refer to timber stand improvement as timber profit improvement.

Lumber milling is chronically behind procurement. Moreover this disproportion is increasing. According to data of the Institute of Economic Research of the Far Eastern Scientific Center of the USSR Academy of Sciences, almost 30 percent of the timber logged here is used as whole logs. Mechanical methods--sawing predominantly--dominate among the wood processing methods. That is, once again production involves relatively narrow and high requirements on the quality of the raw material.

Narrowness is also displayed in the orientation of wood processing, and consequently in procurement of conifer timber. On Kamchatka for example, consumers shy away from birch lumber. As a result construction sites in the oblast center are enclosed by temporary fences made from good conifer boards.

One of the ways of achieving full utilization of raw materials, and particularly low-value deciduous wood, is to convert it into wood chips of various

grades. A network of wood chip shops appeared in the Far East in the last three five-year plans. Production of wood panels was expanded, and biochemical operations processing deciduous wood were started up. But for the moment these output capacities are not even able to process all of the wastes from the lower storage sites and the lumber mills. Unfortunately they have had practically no influence on the use of the original felling fund--that is, the raw material located in the forest.

Interdepartmental barriers hinder solution of these problems in many ways. It has long been necessary to organizationally combine all of the components of the forestry complex completely--procurement, processing and silviculture. Should the union Minlesbumprom and the State Committee for Forestry not begin organizing a few experimental integrated forestry enterprises, for example in Khabarovskiy Kray out of the Mukhen Lumber Industry Combine and the Mukhen Forestry Administration, in Primorskiy Kray in the vicinity of Lesozavodsk, and near the city of Svobodnyy in Amur Oblast? Of course, this would require reconstruction of the sawmills to permit wider use of different kinds of raw materials. New plants and new shops would be required. It would be easier to build them if we flexibly redistribute capital investments between different components of a forestry complex.

Scientists are sure that we can not only maintain the logging volume in the Far East but also significantly increase it, and provide the national economy with more diverse kinds of products. But to do this we will need to resolve the contradiction between the historically evolved work methods and the changed raw material situation as it actually exists today. In short, the time has come to rebuild forestry policy in the region.

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CHEMILUMINESCENCE ON THERMAL DECOMPOSITION OF ALKANESULFOPERACIDS

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[Abstract] Exposure of secondary alkanesulfoperacids ( $\text{RSO}_4\text{H}$ ) to  $40^\circ\text{C}$  under Ar in a sealed ampule in  $\text{CCl}_4$  resulted in intense chemiluminescence in the visible part of the spectrum. Extinction with time followed first order kinetics with a constant close to that for the rate of decomposition of  $\text{RSO}_4\text{H}$  (ca.  $2 \times 10^{-4} \text{ sec}^{-1}$  for  $\text{C}_{10}\text{H}_{21}\text{SO}_4\text{H}$ ). The presence of chemiluminescence was tentatively ascribed to the recombination of  $\text{RSO}_4$  radicals. References 1 (Russian).

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